In This Issue—*Analysis of Reo Electrical System*

JUN 9 1922

MOTOR AGE

Vol. XLI
Number 23

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CHICAGO, JUNE 8, 1922

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Dealers often
say to me, "you're
a lucky stiff to get
the Jordan Line"
I always say to them,
"Why didn't you get
it yourself when you
had the chance"?

Howard B Smith

Howard B Smith Inc

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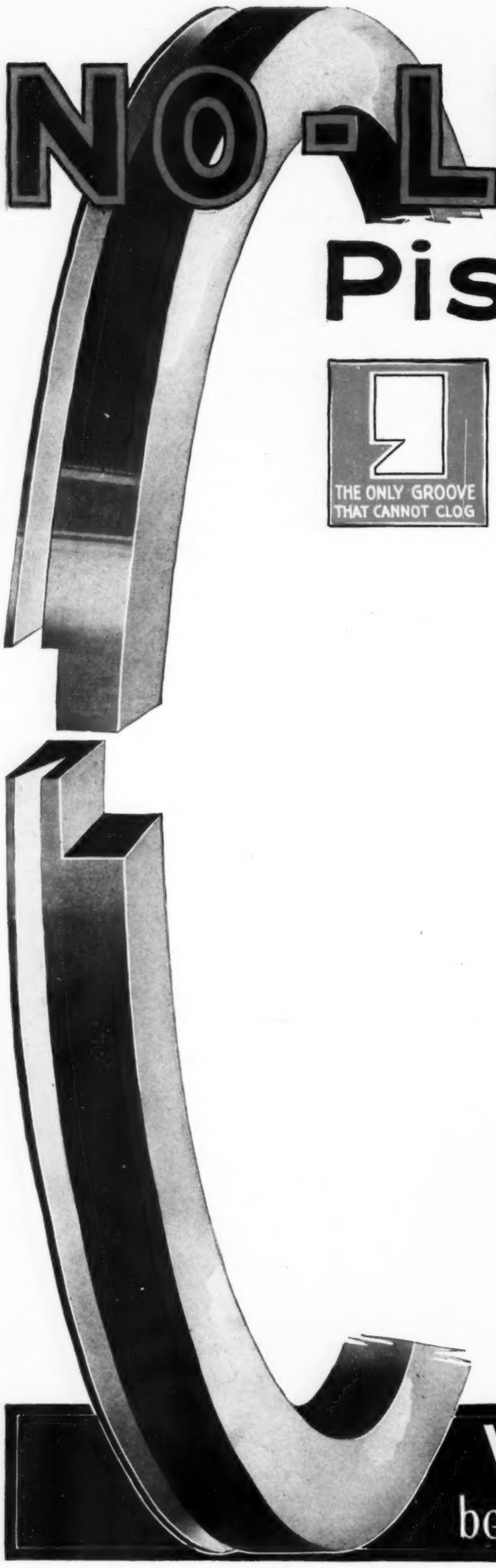

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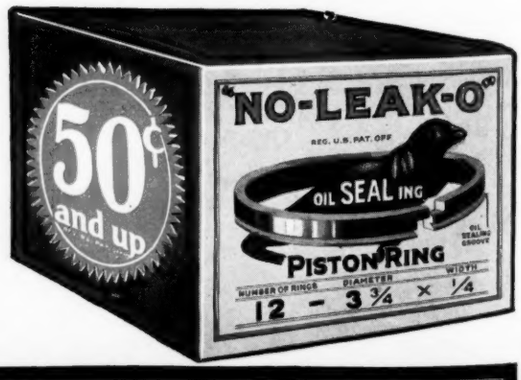

WON'T LEAK

because they're sealed with Oil

MOTOR AGE

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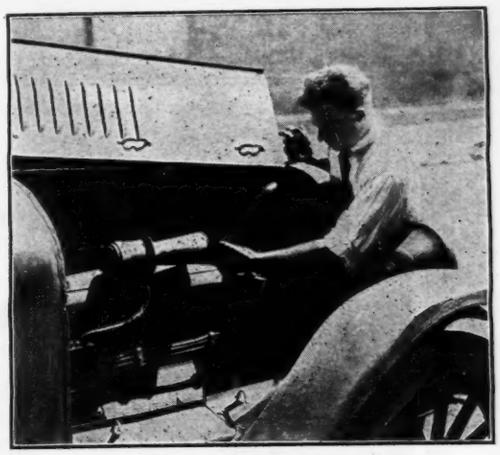

Stands everything
And stands it well!

A *Radiator* Hose *has* to stand everything!

There is the steady heat of the motor—the destructive action of steam, hot water and oil. If there is one part of an engine equipment which *must be good* it is the Radiator Hose. If there is one Radiator Hose that *is good* it is Goodrich.

The Goodrich Radiator Hose
(sold in 3 ft. lengths)

—is a giant for endurance. Through and through, end to end the rubber is designed, prepared and treated to stand the incessant demands made upon it.

The Goodrich Radiator Hose
(sold in 3 ft. lengths)

—gives long service as well as good service. It makes for a satisfactory job and it makes for satisfied customers.

There is also a special Goodrich Radiator Hose for Ford Cars.

You can't go wrong with Goodrich Radiator Hose and you are sure to go right, so:

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for a supply

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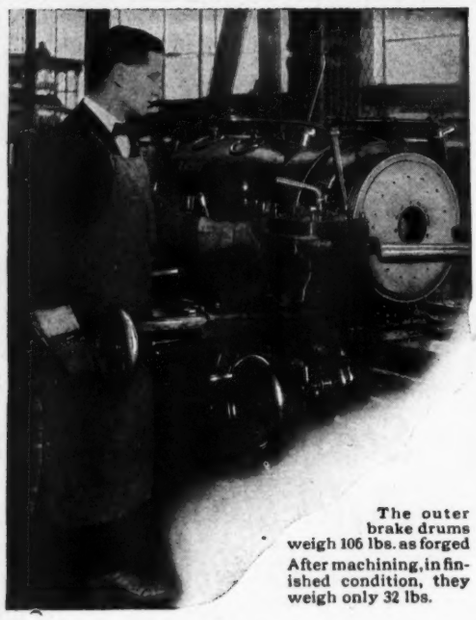
Goodrich
RADIATOR HOSE



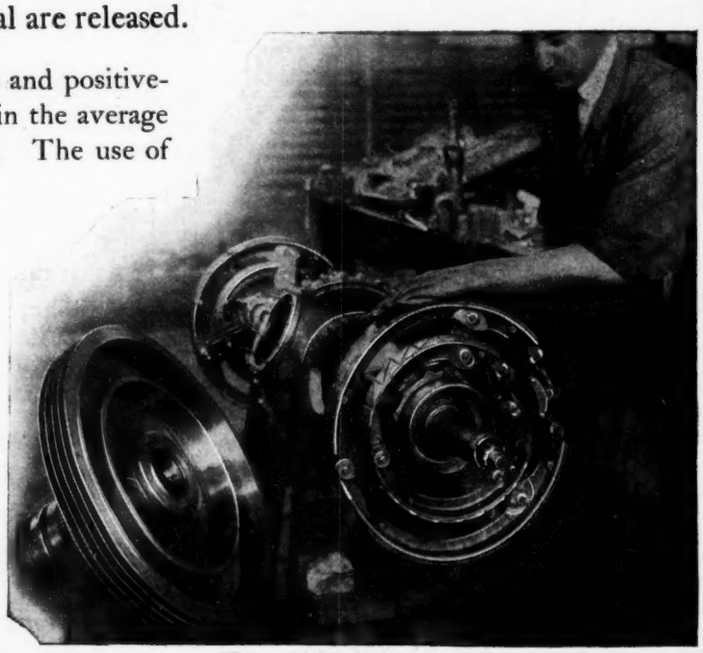
The outer brake drums weigh 106 lbs. as forged After machining, in finished condition, they weigh only 32 lbs.

THE ESSENTIAL FEATURE of *Rolls-Royce* brakes, is their large cooling area, which is about five times as great as that of the conventional type of brake; the almost indestructible lining, and the extreme rigidity and positiveness of the operating mechanism. Rolls-Royce brakes are built, from the rough forging, entirely in the Rolls-Royce works, Springfield, Mass.

ROLLS-ROYCE

brakes are heat-proof, water-proof, oil-proof; absolutely protected from road-dust; have exceptionally long life, and are always perfectly free when the lever and pedal are released.

They have a smoothness and positiveness of action not found in the average car, even of higher price. The use of the engine, as a brake, on long grades is entirely unnecessary on Rolls-Royce cars.



Great care is taken in the erecting of the brakes. Each lining is bedded to the drum by hand, and must bed perfectly, all around, before it is passed, thus insuring smooth and positive action.

Vol. XLI, No. 23 Chicago, June 8, 1922 $3 Per Year

MOTOR AGE

From Track Crashes Comes Safety

THE reason we have faster, better and safer race cars today is because our engineers and builders have learned from wrecks. Some part lets go, perhaps. To avoid a recurrence new designs, better constructions and better metals have been developed from year to year until today we have race cars smaller, lighter, faster and safer than ever before. This experience, in turn, is reflected in the building of lighter and safer cars for the public.

How Racing Failures Have Improved Car Design

Automobile Construction in General Has Been Greatly Advanced by Application of the Knowledge Gained from Results of Terrific Strains Imposed

By B. M. IKERT

WHILE the tenth annual Indianapolis 500-mile race was a wonderful spectacle from the standpoint of the fan, it was infinitely more so for the designer, engineer and builder of automobiles. That all of the first five cars to finish smashed the old track record for the five-century mark is an achievement, doubly so when it is considered that the new marks were made by cars of only 183 cu. in. displacement, whereas the old mark was made by a car in the 300 in. class.

Clearly, the running of this race proved more than ever the strides which have been made in the building of racing cars. Faster and smaller engines, safer cars, better steels and alloys, prettier cars, all of them the results of weeks and months experimenting and testing in laboratory and shop. No race car

is built in a week or a month. What we see today on the track is the application of lessons learned in past years. It is unfortunate when a race car smashes, yet the wrecks very often have furnished the best material from which to mold new designs. Only by carefully going over a wrecked race car can the cause for the crash be determined. Maybe it was a flaw in the metal of the steering knuckle; perhaps a wheel hub wasn't strong enough, or maybe the driver hit the wall. If he remains alive, he can tell what happened, but if he is dead, the remains of the car must be picked apart to see whether it was driver or car.

No Serious Accidents This Year

One of the most noteworthy things about this year's race was the fact that no serious accidents occurred. In the early days when metals gave way more easily, lives were lost. People said racing ought to stop. Yet the very people who today ride on the boulevards and country roads in their cars owe much of their safety and faith in the cars they have to the boys who stake everything on a race as punishing as the 500-mile classic.

To the race spectator, the dropping out of a contestant does not mean very much, unless he is a popular driver and has the crowd with him. But, when the disabled car is wheeled or hauled to the garage, then and there begins the examination by experts. It does not stop there. When the engine or chassis is torn down later on there begins a more detailed examination of every important unit and part. Parts are micrometered and careful deductions are made in order that future efforts will be governed by what has been learned.

"Number 8 out with a broken valve spring," or "Number 5 out on the 27th lap with a loose fuel tank" are expressions among those broadcasted by the announcers at a 500-mile Indianapolis race. Ever since the first race of this distance was run over the famous Hoosier oval, these expressions have been common to every race.

They have been common because there is neither man or machine that will finish the full distance in every race he enters. There is no engine that a designer and builder can enter in a race so severe as the Hoosier classic and expect that engine will be free from any trouble whatsoever. Axle shafts will break; valves will break at the neck and drop the heads into the cylinders; frames will crack; fuel tanks will become loose or leak and now and then a car will be disqualified for smoking or it may hit the wall and become disabled.

Smaller Parts With Greater Strength

So, as long as we have cars circling the brick oval at speeds between 90 and 100 m. p. h. we are quite sure to have mechanical troubles. Some of these troubles become less common as time goes on and as our engineers and builders develop new things and as our makers of steels and alloys develop new formulas, producing metal which is stronger and lighter. In the old days of racing it was customary to make parts heavy and bulky to get strength. In today's cars we have the same parts weighing half as much, yet twice as strong.

1—Broken connecting rods	17.
2—Wrecked cars	14.
3—Broken valves	7.4
4—Oiling troubles	5.1
5—Steering gear	5.1
6—Wheels	6.6
7—Engine trouble (general)	5.9
8—Pistons and rings	4.4
9—Disqualified	4.4
10—Crankshaft breakage	3.7
11—Fuel tank	3.7
12—Clutch	2.2
13—Cooling	2.2
14—Cylinders	2.2
15—Camshaft	2.9
16—Crankcase	1.4
17—Driveshaft	1.4
18—Ball bearings	1.4
19—Main bearings	.7
20—Fuel line breakage	1.4
21—Differential	.7
22—Gearset	.7
23—Flywheel	.7
24—Rear axle	2.2
25—Frame	.7

Percentage table of cause of elimination from 10 Indianapolis races

But even with this fact in hand the present day race car may develop trouble on the track. Engines are turning over much faster than they did in those days, because with a decrease in piston displacement there has come a resultant faster operating speed of the engines to get a higher maximum speed. To appreciate this one has only to note that the car which Harroun won the 1911, 500-mile race was fitted with an engine having a piston displacement of 447 cu. in. and averaged 74.59 m. p. h., while the car which Murphy drove this year was fitted with an engine close to the 183 cu. in. limit set for the cars of 1920, 1921 and 1922. Yet Murphy's car averaged 94.48 m. p. h.

Engines With High R. P. M.

The mere fact that the engines are turning over faster and the cars are traveling at a greater speed than ever before does not, however, seem to make much different in the number of cars which were eliminated due to mechanical troubles during the running of the race. For instance, the following table will show how this number varies from year to year, averaging 13 cars:

Year	Piston Displacement	No. Cars Entered	No. Cars Eliminated	M. P. H. of Winner
1911	600	38	14	74.59
1912	600	23	15	78.72
1913	450	26	16	78.92
1914	450	30	17	82.47
1915	300	24	13	89.94
1916	300	21	9	83.26
1919	300	33	16	88.06
1920	183	23	11	85.50
1921	183	24	13	89.62
1922	183	27	12	94.48

In all there were 136 cars which started in the Indianapolis 500-mile race since its inception in 1911, which were put out of the running for one reason or another. Naturally the troubles would be of a varied nature, but it is the engine as a unit which is responsible for the majority of failures. This is not to be wondered at when we stop to think that the engines in the cars of today are turning over between 3,000 and 4,000 r. p. m. and that next year's engines, of 122 cu. in. displacement will exceed these figures.

Burned Out Connecting Rods Lead

One must think of the terrific work which parts like the valves and pistons are doing in the time of running a 500-mile race in a little over 5 hours. It must be borne in mind, too, that these parts are operating at high temperatures and to add to the whole thing there is the vibration of the track to consider.

An analysis of the 136 failures which have occurred in the 10 Indianapolis 500-mile races which have been run to date shows that the greatest number of eliminations were caused by burned out or broken connecting rods. Twenty-three cars fell by the wayside from this cause.

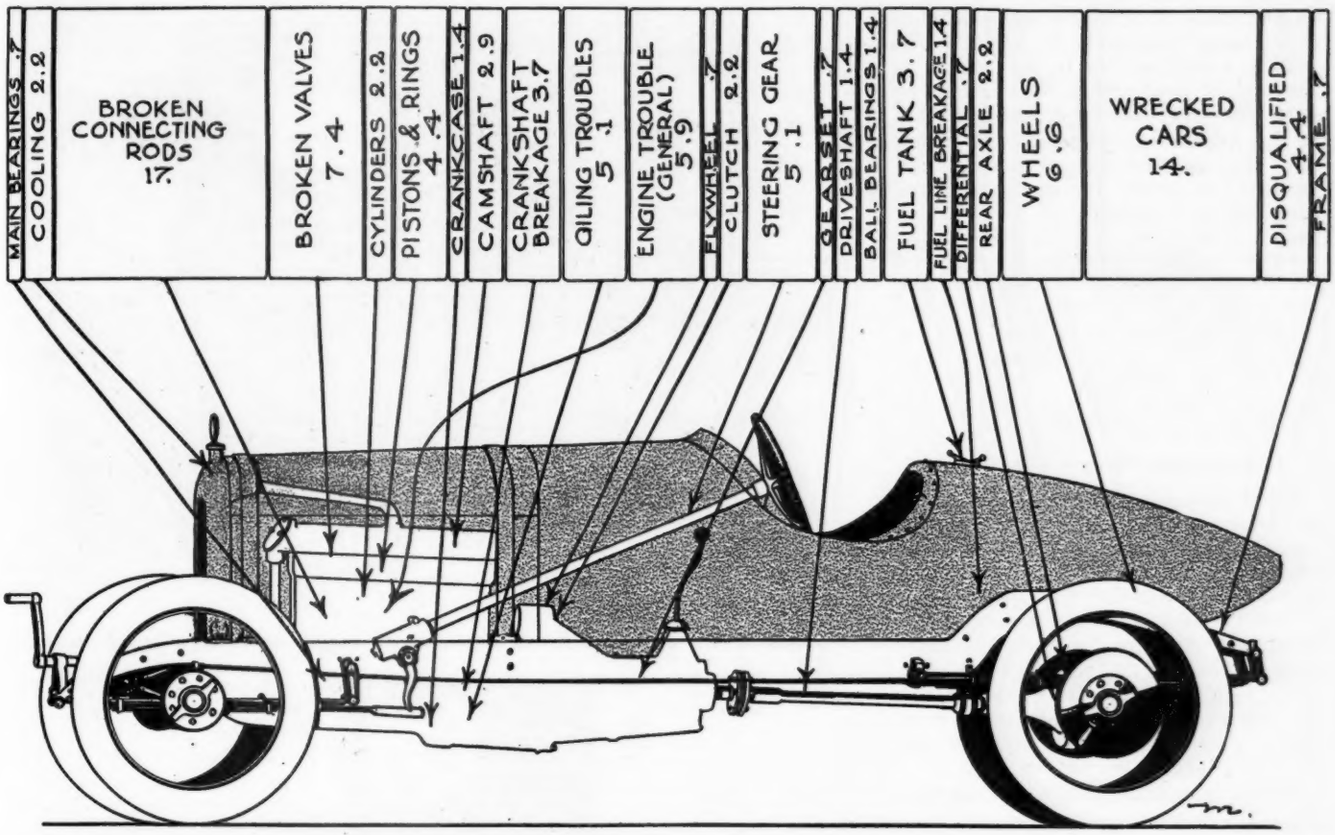
Next in order comes wrecked cars, the chart showing that 19 were put out of the running from this cause. Here, however, it is possible to make a sub-division, for while a car may be classed as wrecked, the primary cause of its condition might have been due to a broken wheel, steering arm, etc. We should, therefore, have to class these as wheel or steering arm failures, etc. This is not always possible, because in a car badly wrecked it hardly is possible to sift the evidence fine enough to arrive at the exact cause.

Tremendous Valve Stresses

Valve trouble comes third in the list and this is not surprising. To appreciate the forces acting on a valve and the duties imposed on the valve spring, let us suppose that in an engine turning over at 3,000 r. p. m., which means that the camshaft is turning 1,500 r. p. m., the acceleration period of the valve, that is, the period of accelerative lift from its seat is .00294 sec. This figure is arrived at by assuming that the valve remains open for a total angular movement of the camshaft of 105 deg. and that the acceleration period lasts about one quarter of the 105 deg., or 26.5 degrees, during which travel it will have lifted half its total lift.

Now, if half the lift is 2 in. and the weight of the valve is 4 oz. then the force necessary to produce the acceleration is about 15 lbs. Add the weight of the tappet and half the weight of the spring, plus the spring pressure and it will be at least doubled.

Also, the spring has to do just as much work during the first half of the closing movement of the valve as the cam has to do in the first half of opening movement, thus a 4-oz. valve if it is to follow the cam accurately at 3,000



Graphic representation of the various causes from which cars have withdrawn from the ten 500-mile races. Connecting rod failures top the list, but all of this occurred in past years. In this year's race there was not a single instances of rod failure, a tribute to the the builders of these engines, which turn over between 3,000 and 4,000 r. p. m.

r. p. m. of the crankshaft, may need a very stiff spring.

If the valve be doubled, so far as its diameter is concerned, it will be four times as heavy, other things being equal. Take the weight as being just 1 lb. and the force required increases to 62 lbs. considering only the valve and neglecting the tappet, etc. Add the other masses and the spring required will have to exert a pressure of 120 lbs. at least to close the valve properly. We must remember, too, that 3,000 r. p. m. is not excessive for today's racing engines. Therefore, the figures, in reality are higher than those just given. Is it a wonder, then that Wilcox's Peugeot was put out early in the race by a broken valve spring? The wonder is that more are not put out of the running from this cause alone.

Cause Difficult to Determine

The other causes for elimination of the cars in the ten races are shown in the table, which also gives the percentages. The figures given are as nearly correct as it is possible to give them.

When a car comes to the pit it is difficult on the spot to give the exact cause for withdrawal, unless the cause is obvious, like a broken frame. Thus, if a connecting rod has burned out, there is likelihood that the trouble might have been in the lubricating system. In the classification of the trouble, however, we would put it down as connecting rod trouble.

In speaking of the oiling system, it is surprising how few engines out of the 136 were forced out from failure of the system to function. Only seven engines were relegated to the column of "also rans" from lubrication difficulties. This includes those which might have been forced out by a broken oil lead, etc., which in itself cannot be taken as a misfunctioning of the system.

Lubrication Problems

The question might be raised why an engine which lubricates all right for 5 min. at high speeds does not continue to do so for several hours as long as sufficient oil is forced to it. The answer is that in a racing engine the temperature continues to rise after the engine has started to do its work. Take an instance:

Suppose that a piston received from the explosion 100 units of heat and that between one explosion and the next, the piston is able, by reason of its design, to transmit all the 100 units to the cooling water, then the engine will continue to run without the occurrence of piston trouble. But now if the piston is able to take away only 99 units of heat between one explosion and the next, then every explosion will put into the pistons 1 unit of heat more than is taken away from it by the cooling water. The piston expands a little for each unit of heat put into it. The number of units required to expand it to a point where it will begin to get tight in the cylinder depends upon the design of the engine.

Thus if the piston is gaining heat slowly, the engine may be able to run for 10 minues satisfactorily with the piston getting hotter all the time. At the end of 10 minutes the surplus heat in the piston may have reached a point of where the latter will begin to get tight in the cylinder. This is one reason why the fact that the engine will run satisfactorily and develop its full power for 5 or 10 minutes is only partial evidence that it will continue to do so for an hour or the time required to finish a 500-mile race.

Forced Oil Circulation

The record of lubrication failures of racing engines is not sufficiently full to allow of very accurate deductions, but there is enough at hand to show that forced circulation is the only safe means by which these high speed creations can be properly cooled. There are two advantages possessed by the pressure feed system. First, the pressure easily dispatches small particles of dirt and second, the rapid passage of the oil in the bearing makes the circulation more rapid and thus tends to keep down the mean temperature of the oil. Yet some designers and builders of racing engines deem these only small advantages and offset them by the reduction in size and

weight made possible by the use of a ball-bearing crankshaft.

That which applies to the piston in the way of heat applies to every other part. The friction of the bearings heats up the crankshaft, camshaft and piston pin. The general rise in temperatures heats the oil itself. Increasing temperature causes expansion in the various parts and thus causes a reduction in the tolerances settled upon by the engineer. As the oil gets hotter its lubricating power becomes less. Therefore, if the working temperature of any parts is underestimated in the original design, then the lubrication almost certainly will prove defective in the engine if it is run continuously for a length of time.

Lubrication Failure Disastrous

While connecting rods top the list in the matter of failures, it must not be construed that the fault lies in the rods themselves. The failure of the oiling system, as was pointed out, may cause a bearing to "seize" and result in the eventual twisting of the rod. The bearings in a racing engine which are most likely to give trouble are the lower and the upper ends of the connecting rods. These bearings are subjected to the greatest pressure per square inch.

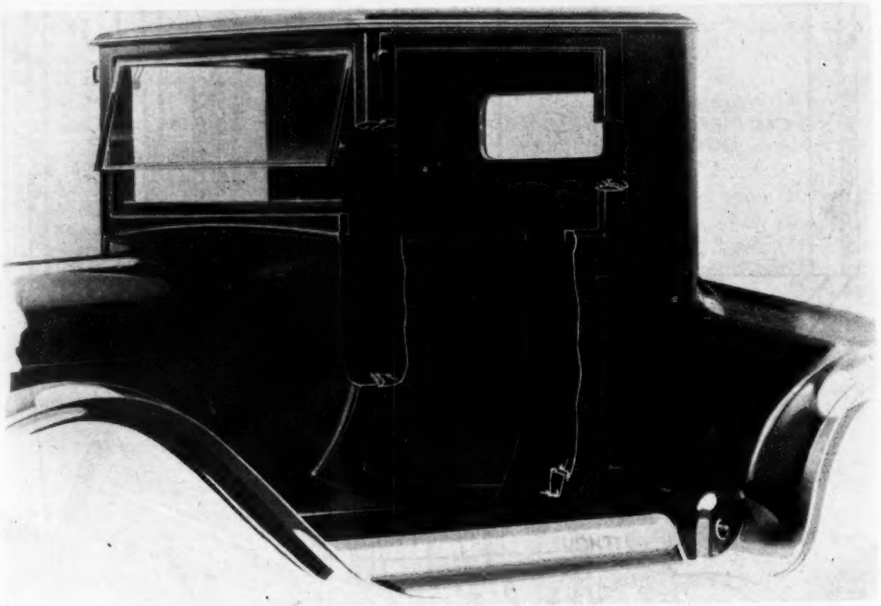
In the matter of crankshaft bearings there are two alternative designs. One has plain bearings for both main and connecting rods and the other plain bearings for the rods and ball bearings for the shaft. There has been remarkable little trouble from main bearing failure, both plain and ball types.

The Peugeot engineers were the first to get any real success with ball bearings for the shaft and they used this type not so much to cut down friction or avoid the necessity for a high pressure system of oiling, but to reduce the overall length of the engine and thereby cut down its weight. They wanted to get the lightest car possible so as to obtain maximum acceleration and hill climbing ability for road racing in France. These ball bearings gave no trouble and therefore, the Peugeot design has been copied extensively.

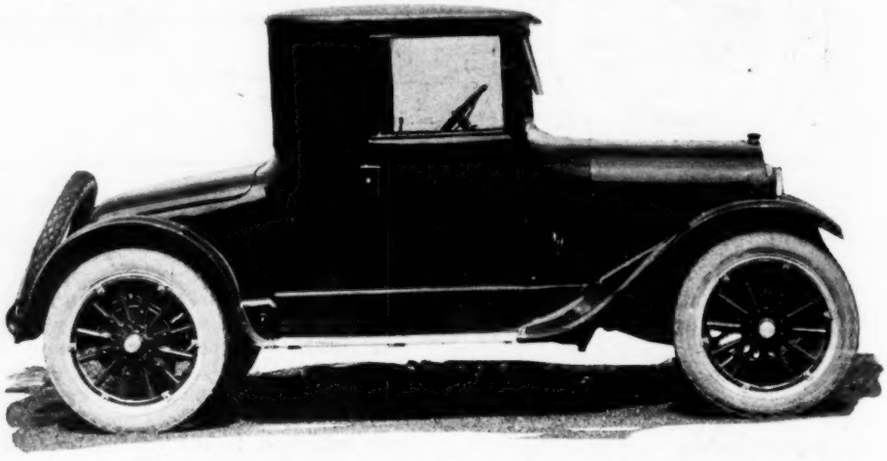
Such units as the crankcase, driveshaft, differential, gearset, flywheel, etc. have been remarkable free from trouble so far as being primary causes for the withdrawal of cars.

122 Cu. In. Next Year

What will happen next year with the cars of 122 cu. in piston displacement is impossible to say at this time. With the smaller engines and resultant higher crankshaft speed, there will be new problems to solve. Lubrication will have to be given considerable thought and the same is true of cooling. But when we look over the accomplishments of the engineers and builders of race engines since the first running of the Hoosier classic there is every good reason that the 122-in. cars will be as fast and safe as their predecessors, the 183-in. engine, which has just finished three years of stellar performance.



Sectional view of new Dodge all steel body showing elimination of wood framing



New Dodge business coupe with all steel body. Wood framing has been eliminated and this body is finished with baked enamel

New Dodge Brothers All-Steel Coupe

THE new Dodge business coupe, the first all-steel closed car with a baked enamel finish is being shipped to dealers. For some time past Dodge Brothers has been experimenting with closed body construction in the endeavor to put out a closed car with the baked enamel finish employed on Dodge open cars. It has been found impractical to use the baked enamel method of finishing cars employing the wood frame, because of the destructive influence of the high baking temperature required for the enamel on the wood.

The ability to use the all-steel construction for closed cars is unique. Outside of the advantage of being able to use the baked enamel finish, the employment of steel stampings makes available for this type of body the same machine production methods employed on open bodies and practically eliminates the costly hand workmanship required to construct the wood frames. This process will facilitate quantity production by eliminating the large amount of time consumed in applying the numerous coats of paint required on wood frame bodies.

These savings in production cost have resulted in the ability to fix the price on this car at only $100 more than the five-passenger open body.

In the construction of this car practically all wood has been eliminated and what little is employed is added after finishing, to serve as a foundation for tacking the upholstery and trimming. From a structural standpoint wood is not utilized. Even the frame work and panels are of steel, making for a light construction. The car is upholstered in genuine leather, equipped with cord tires, heater, dome light, windshield cleaner, and adjustments for raising and lowering the windows.

The line changes in the coupe will obtain throughout the Dodge line. The cowl is raised slightly to give a straight line effect from the radiator to the dash. All cars are now coming through with semi-floating axles of heavier construction than the previous floating type. The North East speedometer has been adopted.

GEE! DON'T YOU FEEL CHESTY!

YOUR PLACE LOOKS PRETTY GOOD AND ATTRACTS A STRANGER
YOU MEET HIM COURTEOUSLY
SHE WONT RUN ON THE MAG!
BUT CAN'T SEE ANYTHING WRONG
YOU HUNT AWHILE WITHOUT LUCK THEN DECIDE TO CONSULT YOUR DIAGRAMS
WAIT A MINUTE
YOU MAKE A FEW MENTAL NOTES
GEE! THIS IS A COMPLICATED MESS!
BUT THEY DON'T GIVE RESULTS SO YOU FINALLY TELL THE OWNER
THAT THE MAGNETO WILL HAVE TO BE TAKEN OUT TO BE TESTED. COULD HE COME FOR THE CAR ABOUT NOON?
THEN YOU GO TO WORK WITH YOUR DIAGRAM
AND IN SHORT ORDER LOCATE A LOOSE CONNECTION.
THEN THE OWNER COMES AND IS TICKLED PINK TO BE CHARGED ONLY 1 BEAN
FINE! HAVE A CIGAR
YOU HAVE MADE 100% PROFIT AND GOT A GOOD NEW CUSTOMER
GOIN' T' HAVE THE OLD BUSS COMPLETELY OVERHAULED SOON. LET ME KNOW WHEN YOU'RE FIXED T'HANDLE IT QUICK AN' I'LL BRING IT IN
GEE! DON'T YOU FEEL CHESTY?
WOW!!
TOM WILDER

We Must Make It More Convenient to Buy An Automobile

With the Universal Adoption of the Motor Car, Buying Has Become a Habit—More Dealers Will Be Necessary to Meet the Changing Demands of Purchasers

By HARRY TIPPER
Written for Automotive Industries

ALL plans looking into the future for the establishment of permanent marketing policies must take into account the reactions of the buyer and his habits of buying. The methods of distribution, specialization, the character and extent of the service requirements, will be built up permanently because of the desire of the buyer rather than because of the necessity of the manufacturer. Many difficulties are in the way of the proper estimation of these effects upon the field. These difficulties are more evident in the automotive field because of its rapid growth.

The problem of distribution and service in the automotive field is different from the ordinary retailing problems. It involves a good many interests not involved in the work of other retailers. This entire distribution field, in its wholesale and retail aspects, has come within a decade and has involved many problems for which there were no precedents. Under such circumstances, it is natural that the whole field of marketing from the manufacturer to the user should be confused to some extent and present a great many conflicting tendencies.

No Precedents Within the Industry

There are no precedents within the field itself from which to measure the strength of these various tendencies, and the history of other fields is not entirely applicable, although an understanding of their development would be very useful in estimating the possibilities. To judge the problem, therefore, it is necessary to consider carefully the habits of the general buyer and the tendency to be observed in the sale of products to him in all the usual developments.

Up to the year 1920, the automobile was establishing itself as a flexible means of individual transportation. The main object and necessity was to secure its use, and the industry responded by providing a large number of units in the shortest possible time, so that this convenience could be put to work as rapidly as possible. The great object in the mind of the general buyer was to secure this means of transportation, and out of this reaction the statement has grown that every individual desires to own an automobile. The very character of the product emphasizes its usefulness.

No other product in modern times has so continually emphasized its own value and its own desirability. Every automobile in motion suggests the value of ownership. Every automobile in use suggests the convenience of this means of transportation.

Economists have wondered many times at the propensity of the general buyer to indulge in luxuries or to buy things which do not appear to be necessary, at the first opportunity, even when some of the apparent necessities are being overlooked.

The buying of the general public, however, is governed not by the necessity of the article so much as by the relative intensity of desire for the particular article.

Unless the necessity is very great, therefore, the average buyer will reserve some of his earnings for the buying of things that are not usually considered necessary because his desire to own these things is more intense than the desire for the necessities. In all sections of the population, some conveniences will be left out in order that more desirable conveniences may be secured.

Relative desire is very largely a matter of emphasis, and the emphasis is not in proportion to either the necessity or the need of service. An illustration of this difference is afforded by the rapid growth in the use of radio apparatus during the months of 1921 when many of the lines included in the so-called necessities were still halting along with a subnormal business.

Motor Cars As Part of the Social Fabric

We have stated that the convenience of the automobile is emphasized perhaps more than any other item in the public mind and this emphasis is reflected in the publicity given to the automobile business and the place which it takes in conversation in ordinary circles.

As the automobile grows into its regular place in the social fabric, this emphasis will be lost to some extent by familiarity, and the buying in connection with the automobile will be done more and more as the buying of other necessities. In all other lines of business dealing with necessities, the system of distribution has extended itself continually so that the convenience of buying could be more definitely established in all the separate communities. When articles become so purely a part of the routine life that they are virtually necessities, the buying is conducted more regularly and at shorter intervals because it does not receive the consideration that was formerly given to it.

It is likely that the distribution system in the automotive field will extend itself so that the convenience of buying all commodities connected with the use of the automobile will keep pace with the growth and the absorption of the machine into the social fabric. As it stands today, the number of dealers in the automotive field, in proportion to the amount of business done, is very much less than in the hardware, the textile, and other retail lines. People were willing to go to considerable trouble in order to buy an automobile, and they are willing to go to considerable inconvenience in order to secure the supplies and commodities necessary to keep it running.

As a consequence, the number of retail establishments is comparatively small in proportion to the total amount of the business to be done and the widespread distribution of the automobiles themselves.

The whole field has grown with such rapidity that the maximum demand upon the retail outlets has not yet been reached.

As the number of cars in use grows each year, the amount of time and effort involved in keeping those cars supplied with their required equipment and service will be increased, and, as a consequence, the number of retail outlets will necessarily be enlarged to meet these increased requirements.

The habit of the user in demanding convenient places in which to buy will contribute to the enlargement of the number of outlets, and to the character of those outlets.

At present, the whole automotive business is in a period of readjustment not merely from the depression but from the absorption area into the stable area of development in

accordance with the growth of the social fabric, in point of numbers and wealth.

In other words, the past ten years have been spent in providing a sufficient number of machines to supply the needs of the population, the present period being spent in adjusting the business to the requirements of the population and, in the not very distant future, business will be shaped to the growth of the population and wealth. In this particular period, when the automobile is being adjusted to the requirements of the population, the desires of the buyer are going through some definite changes in his reaction toward his automotive buying. New elements of valuation are entering into the purchase, and these elements arise out of a previous experience with the automobile itself—its usefulness and possibilities.

Changing Methods of Distribution

The bouyancy of the automotive field in its return from a condition of extreme depression has been surprising to many business men. This bouyancy is due very largely to the emphasis which is attached to the automobile and the effect of that emphasis upon the desire of the purchaser.

The readjustment of values in the buying is to be discovered in the character of the buying and the way it has flowed in response to readjustment in price or service by the manufacturer or the local retailer. The various tendencies observable in the retailing field are induced by the attempts on the part of the manufacturer and the retailer to adjust the method of distribution to the changed attitude of the buyer.

It is the experience of industry that buyers from the general public demand a greater convenience in their buying as the product falls more and more into the routine of regular necessity and gets away from the novelty or the emphasis of occasional or new demands.

Similarly, as the product is measured by constant use, the elements of valuation in the product change and the sales approach of the manufacturer or the retailer must be altered to agree with those elements of changed valuation. The various tendencies to be observed in the retail field of the automotive business are due to the readjustment which is going on, and their value cannot be completely determined at the present time.

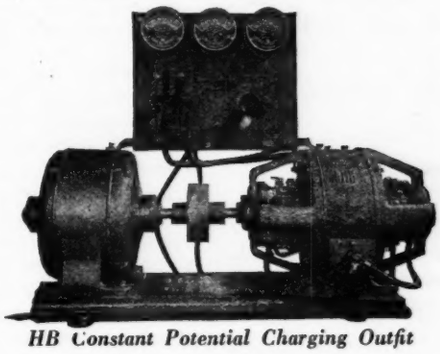
HB Constant Potential Charging Outfit

THE idea of a constant potential charging of storage batteries is that a storage battery can absorb a large amount of current when nearly empty. As it becomes more nearly charged, the amount of current absorbed is radically reduced. With this system, batteries are not forced to take a current as in series charging. With constant potential charging, batteries draw in just the amount of amperage needed, which automatically is reduced as batteries become more nearly charged. The batteries themselves regulate the amount of current they take in, consequently there is little possibility of harm to the batteries from overheating and similar causes.

The HB Constant Potential system consists of a three kw. double wound generator with a commutator on each end that will deliver from each end seven and a half volts 200 amps., giving a 400 amp. output under normal load or a 500 amp. output when necessary for short time. This generator is direct connected to a ball-bearing 5-hp. motor running at 1,200 r.p.m. Both are mounted on a single base connected by a flexible coupling.

It is difficult to rate the output of a constant potential outfit in number of batteries charged. Practically any number of batteries can be charged, provided the total does not exceed the capacity of the machine. For example, one may have three batteries which have just put on for charge, taking 50 amps. each, or 150 amps., four batteries on two hours, taking 25 amps. each, or 100 amps., and five batteries on three hours, taking 10 amps. each, or 50 amps. As the HB outfit is a 400 amp. outfit, it is possible to have twenty batteries in addition, partly charged, taking say 5 amps. each, totaling 100 amps. in all, thus making thirty-two batteries in all on a charging rack.

The price of the complete outfit is $165. It is made by the Hobart Brothers Company, Troy, Ohio.



HB Constant Potential Charging Outfit

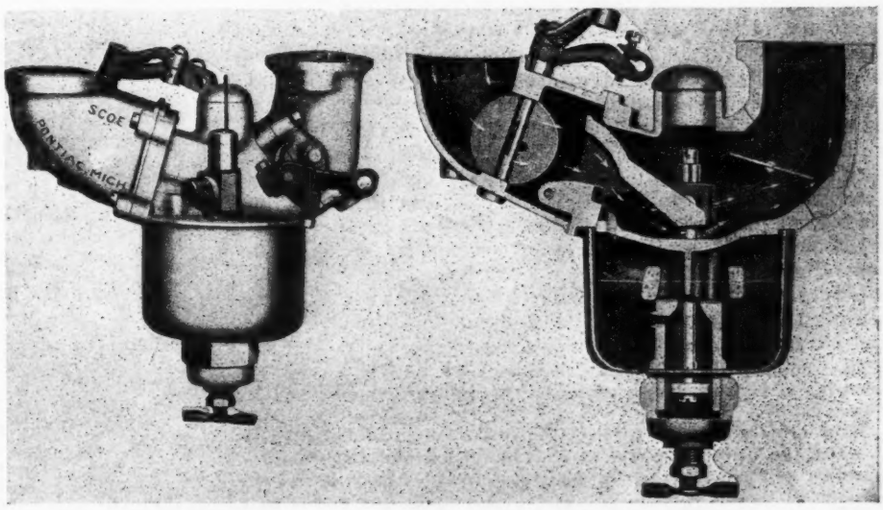
The Scoe Carbureter

IN the Scoe Carbureter the metering pin is operated by the air shutter and its travel governed by the quantity of air being drawn in by the engine. The metering pin carries two entirely separate jets, one of which is so arranged that its feed may be held constant or diminished as the air shutter rises, and the other may be held constant or increased. By varying the proportions and the timing of these two jets it is possible to get practically any mixture desired at any degree of opening. The charateristics of the carbureter are said to be a fairly rich mixture for idling, richer for slow pulling and acceleration, lean for normal driving at ordinary speeds and slightly richer for high speed.

The central jet is fed by two lateral holes and is adjustable at the top with a baffling screw. Since the central jet supplies most of the fuel in the idling position, this adjustment controls the idling mixture. The location of the upper lateral feed hole governs the timing of the jet restriction or the car speed at which the mixture becomes leaner.

The second jet is flat, milled on the front side of the metering pin stem, the jet being formed by the space between this flat and the guide in which the metering pin operates. The stream of air always holds the metering pin forward in its guide. The flat jet terminates at the top in a step which permits the fuel to feed very slowly while the engine is idling, it is stated. This feed is used to keep the column of fuel constantly at the top of the flat jet and available for quick acceleration.

The venturi is formed by the space between the air shutter and the floor of the carbureter. As the air shutter rises, the size of this venturi is increased. The carbureter is made by the Briscoe Devices Co., Pontiac, Mich.



Exterior and sectional view of Scoe carbureter

Why Every *Automotive Dealer* Is Interested *in* World-Wide Finance *and* Politics

The Leaders of Agriculture and Business Explained This at the Recent Meeting of the Chamber of Commerce of the United States—Briefly the Answer is That These Conditions Affect the Buying Power in Your Community

By JAMES DALTON
News Editor, Class Journal Co.

WHEN James R. Howard, president of the American Farm Bureau Federation was asked recently by a New York banker what were the greatest agricultural problems confronting the American farmer, he responded:

Transportation, including merchant marine.
Industrial production.
International exchange.
The balancing of European budgets.
German reparations.
Solution of the Russian problem.

Howard is a shrewd, far-seeing man and he has visualized the inescapable interdependence of world commerce. He knows that if every man, woman and child in Austria, for example, can dig up enough cash to pay for two loaves of bread a week, where they have been buying only one, it will mean higher prices for the wheat grower in Kansas.

The Farmer Knows World Conditions

He knows that if each of the male natives of India buys two cotton shirts a year instead of one, it will mean a stronger market for American cotton.

Too many people are prone to regard the farmer as a hick just because he wears overalls. As a matter of fact the average of hicks is higher in the cities than in the country.

You can find more farmers, for instance, than you can business men who can tell you exactly what the collapse of Communism in Russia means to America. They have a very clear idea of what it will spell, ultimately, not only for themselves but for industry generally.

The farmer has found it profitable to study national and world problems in relation to his own products and his own markets. The rank and file of men in the automotive and other industries would find it worth their while to take time every day to keep abreast of what is going on.

It may be difficult for the automobile or truck dealer in Wheatvale, N. D., or Cottontown, Ga., to figure out what concern it is of his whether the natives of India buy more shirts or the natives of Austria more wheat, but it is likely to make a material difference in the volume of his sales. If wheat and cotton prices go up 10 cents or 10 per cent it may be the determining factor in purchases of cars and trucks by the growers or planters in his territory. There are great stretches of the country where it may mean comparative prosperity or depression.

Leaders of the automotive industry sometimes get a bit discouraged because so little interest is manifested by the rank and file in problems of the highest importance.

The Indianapolis sweepstakes may be more interesting than the financing of highway construction, but the relative importance is as 0 to 100.

Many dealers from all parts of the country went to Indianapolis to watch the "speed demons" in their merry-go-round but when the Chamber of Commerce of the United States gave over one of the sessions of the annual convention at Washington this month to a consideration of highway financing, one of the most vital problems of the industry, the attendance numbered 35. Twenty-four men were there when the meeting was called to order and the rest drifted in later. Representativs of the automotive industry numbered a few more than the representatives of the brick and cement interests. Not even one dealer from Washington was present.

These meetings of the Chamber of Commerce offer little in the way of jazz entertainment but they provide a carload of food for thought. The session at Washington was regarded by President Harding as of sufficient importance to justify him in breaking up an extraordinarily busy day at the White House so he could address the convention. His coming may have been due to the fact that previous speakers have voiced polite disgust at the proposal to build a tariff wall around the country and in discussing European conditions had expressed sentiments reminiscent of League of Nations advocates, but he came nevertheless.

Two members of the cabinet, Secretaries Hughes and Hoover, also were speakers.

The convention had one of those well known "keynotes" and it was world trade. The same key was struck at Atlantic City last year. It is significant that the greatest commercial organization in the world considered foreign problems more pressing than domestic questions in the midst of a deep business depression and stuck to the same general theme when the country was recovering its prosperity.

The Automotive Dealer Should Know

One of the most striking addresses of the convention, even including the President and the cabinet officers, was made by Howard of the Farm Bureau Federation. He applied the problems of Europe, the tariff and transportation to the farmer and demonstrated how they are affected, but the speech could have been made with equal logic by a representative of the National Automobile Chamber of Commerce, with a slightly different application.

Every automotive dealer should know something about all phases of transportation and he should know a great deal about highway transport.

Every automotive dealer should know something about the relation of European problems to American exports because the volume of exports determines the degree of prosperity the country shall enjoy. If the total volume of exports rises to 15 per cent it will mean an even greater increase in the volume of automotive sales in this country for the increase in earnings works back all along the line from exporter to producer. It is safe to say that a few cents of every dollar of profit in the field of foreign trade are spent for something automotive.

Moral Obligation to Europe

Listen to Howard for a minute.

"So keenly do the farmers of the country realize not only our moral obligations to Europe in the time of their distress but our own economic dependance upon their welfare that we insist upon such liberal grants of credit as can be safely accorded them and object to any tariff barriers which would prevent an easy flow of world commodities," he says.

"In recent years exports, particularly when compared to our total population, have been falling off due to increased domestic demand. We are still, however, exporting more than one-half our total cotton, almost one-fourth our wheat, as well as vast quantities of other cereals and pork products.

We Must Produce a Surplus

"There is no limit to the agricultural possibilities of America and we ought always to produce a food surplus. Our national safety, in fact, depends upon it. But if we produce a surplus we must have for that surplus not only a market but a profitable market. It is because that market lies almost exclusively in Europe that the American market has so vital an interest in the reconstruction of Europe.

"Men may theorize about national self sufficiency and point to the certainty of home markets as compared with foreign, but trading between nations proceeds inevitably and it is not within reason to presume that it will ever end. Indeed, it never should. National seclusion would spell national decadence. The man who takes no part in the affairs of his community is no less undesirable than the nation who wraps her cloak of righteousness about her and withdraws from world society.

"I think it will be fairly clear from what I have stated that the agricultural interests of our country will not be best served by tariff walls so high as to become artificial barriers to the freest possible exchange of commodities. It is only as Europe can sell to us that they will be able to absorb our agricultural surpluses.

Everyone Is Affected by World Conditions

"So nicely are those human relationships which we call economics adjusted that every human affair throughout the world effect every one of us just as every particle of matter in the universe effects every other particle. Thus the Reparations adjustments of Germany are reflected in every farmstead of America. Our interest in foreign finance and foreign exchange is as great and possibly greater than any banking or exporting house.

"The improvement in farm prices which pleases you almost as much as us, are to a marked degree coincident with an improvement in foreign exchange as indicated by easier exchange rates. For example, take May wheat in the Chicago pit December 7 which was low point for that period at 1.09½ compared with May at 1.41½, the improvement was 29 per cent. Between those same dates Sterling advanced 9 per cent, the French franc 23 per cent and the Italian lire 26 per cent.

"Thus the agricultural gloom of December dispelled by the smiles of May is directly reflected in the mirror of international exchange."

After that it might be interesting to know what Silas H. Strawn, chairman of the board of Montgomery, Ward & Co., the big Chicago mail order house, has to say on the subject. Here it is:

Prosperity Related to Prices

"More than one-third of the United States live upon farms or are dependent upon agriculture. Their prosperity depends not so much upon the amount which they produce as upon the price which they receive for their products. While to a certain extent the price is influenced by domestic demand, the foreign demand is the determining factor. This is as true of the United States as it is of Great Britain or any other large producing country.

"In proportion to the reduction of the price of farm products, is the purchasing power of the farmer diminished. The inability of the farmer to buy ramifies through every industry and embraces every article of human consumption. For a hundred years our whole economic development has been adjusted to meet a continuously increasing foreign trade.

"To isolate ourselves, and cut off our foreign trade would result in such intensive competition as to precipitate an economic panic in this country the like of which has never been seen."

A Market for the Surplus

The following summarizes the views of C. H. MacDowell, president of the Armour Fertilizer Works, Chicago, and it will be seen they closely parallel those of Howard and Strawn.

"The recovery and maintenance of a steady European market for our raw materials is one of our most important problems. Foreign commerce is our economic safety valve. Ill-informed or locally selfish interests make it out that less than 10 per cent of our commerce is foreign; that it is not important, so why worry about it—take care of our home requirements and be happy; on to the ball game! We are practically self-contained—they say—and we are, if we care to pay the price. Both we and Europe would pay dearly by our adopting such a policy. We can easily go a good way along this road without knowing it, and then wonder what ails us.

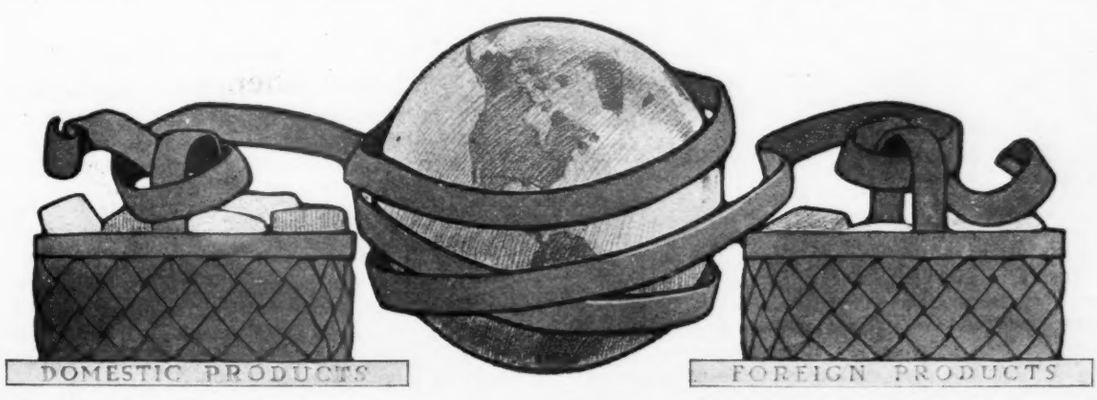
"There is but one broad market today for our surplus cotton, copper, wheat, oil, coal, packinghouse products, naval

The Meaning of Foreign Exchange

WE HEAR a lot about foreign exchange, and a good many of us have only a hazy understanding of exactly what it means. Here is a simple definition given at the convention of the Chamber of Commerce of the United States by John Ross Delafield of New York, former chairman of the Board of Contract Adjustment of the War Department:

"The essence of exchange in its simplest form is that the man who owes money to an American exporter pays him by finding someone in his own land to whom an American in America owes money. From his fellow-countryman he buys the credit and sends it to his creditor in America, who collects from the other American.

"Payments by this method can only go on so long as Americans owe money to the people of the lands to which they export their American products. So long as there are plenty such debts, exchange is readily obtained, payments are easily made, and there is no financial hindrance to trade, but as soon as such credits become diminished the law of supply and demand operates, and the foreign debtor finds he must pay a premium to get exchange, for there are more debtors trying to buy than there are credits to sell. The effect is that exchange rises, the premiums added to the cost of the goods, and these foreigners pay more to buy from us than they would from some other country."



stores, our sulphur, timber, phosphate rock and many other things. This market is Europe.

"Take cotton. More than 50 per cent of our crop is usually shipped to Europe. What effect did the decreased European buying power have on the distribution and price of American cotton in 1914 or late in 1920 and during part of 1921? How did it affect the 1921 crop? Our cotton growers became demoralized. Hard times and an almost complete elimination of buying power, followed.

"How has increased European consumption of our cotton affected prices and Southern feelings since then? Values have advanced. The planter is feeling better and more hopeful. He is planting cotton.

"The prosperity of the cotton South is dependent on a broad European market. Both Southern and Northern industrial prosperity is intimately connected with the buying power of the cotton grower. America is vitally interested in shipping cotton to Europe. If the South cannot market its cotton when grown on a fairly large scale, at a profit to the grower, it will reduce production and we will pay more for our shirts.

"And so it is with other raw materials. Large production, through export, decreases the cost of what we consume at home. A full export demand helps many sections not directly interested in the material exported."

Dwight W. Morrow of J. P. Morgan & Co. feels the same way about it. He says:

"Under the present organization of society, where large scale production is the practice in every civilized country in the world, our foreign and our domestic trade are so inextricably bound together that no man can tell how much of the domestic trade that he engages in is a part of the processes which go into our foreign trade.

Markets Broadened by Advance of Transportation

"The most arresting economic fact in the history of the last 150 years has been the widening of the areas of exchange by the increased means of a communication. One hundred and fifty years ago the work of any one man would affect only the few people in the neighborhood. Almost everything that man consumed was produced close to his home. With the coming of the railroad and the steamship and the telegraph and the telephone our economic areas have kept growing wider and wider. Our foodstuffs are no longer produced in the community in which we live; the product of our own labor may go to the remote corners of the world."

Not all the discussions at the Chamber of Commerce convention were on foreign trade. Reverting to the subject of booms and panics, for example, Morrow said:

"It is the business of sober and reasonable men to remember that in times of optimism men are inclined to think that a period of depression will never come, and in times of depression men of inexperience are inclined to think that there never again will be an adequate demand for goods. In good times, when there is 5 per cent more demand than supply that 5 per cent is apt to look like 500 per cent. The same thing is true of bad times. When there is 5 per cent more supply than demand, that over-supply is apt to look like 500 per cent. With courage, with patience, with tolerance, this great country with its manifold activities should soon pass through its period of depression. In fact, the signs are many that we are already upon the upturn."

The need of distributors for accurate information with which to dispel present uncertainty in business conditions, a subject in which automobile distributors and dealers are deeply interested, was considered by Franklyn Hobbs of Franklin Hobbs & Co., Chicago.

"My sole mission, he said, is to demonstrate and prove by the business history of recent years that business forecasting is not only possible but that all businesses are operated on such forecasts. Every move you make is the result of a business forecast and yet there are few men who have not spoken lightly of, or even ridiculed, a business forecast within the month.

"Successful operations of business for the next few years call for good judgment and hard work; it will necessitate an understanding of business conditions; it suggests more frequent consultations between bankers and their depositors, and more particularly, their borrowers. A closer connection between bankers and business men, such as has existed in Europe for a century, must come about in this country, if we are to build on solid ground."

Lowering costs and stabilizing production by a practical study of business cycles was the theme of Wesley O. Mitchell, economist of the Scribner Co., New York.

The Business Cycle

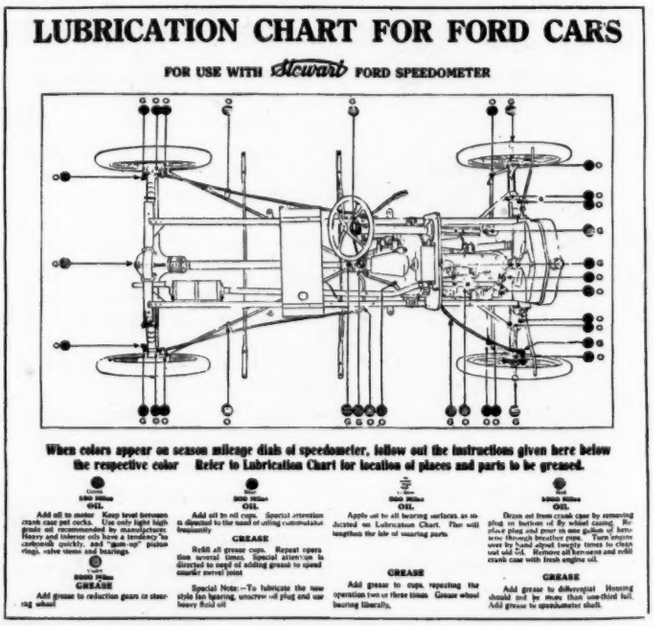
"The only way to prevent a repetition of enormous losses from crisis and depression every few years in the future is to study the business cycle and to learn how to control it," he declared. "That is primarily the task of business men. Government can render some aid, for example by collecting and publishing statistics about current stocks, orders, shipments, prices, employment and the like. But such statistics are of little avail unless they are used by business men.

"Every man who keeps in close touch with developments in his own industry and in general business can make profits for himself and at the same time help to stabilize business and employment for others. Various enterprising concerns have already proved that it is both practical and profitable to take the business cycle into consideration when laying plans."

All phases of transportation also were considered at the convention. One of the speakers on this subject was Frederick De Lano, former president of the Wabash Railroad and former member of the Federal Reserve Board. He discussed the motor bus and motor truck from the viewpoint of the railroad man.

"That the motor truck or motor omnibus will ever displace the vehicle on rails, when all costs, hazards and damages incident to its use are taken into consideration, is unbelievable," he said, "but it has an important place in conjunction with the railways for the gathering and distribution of freight in our large cities."

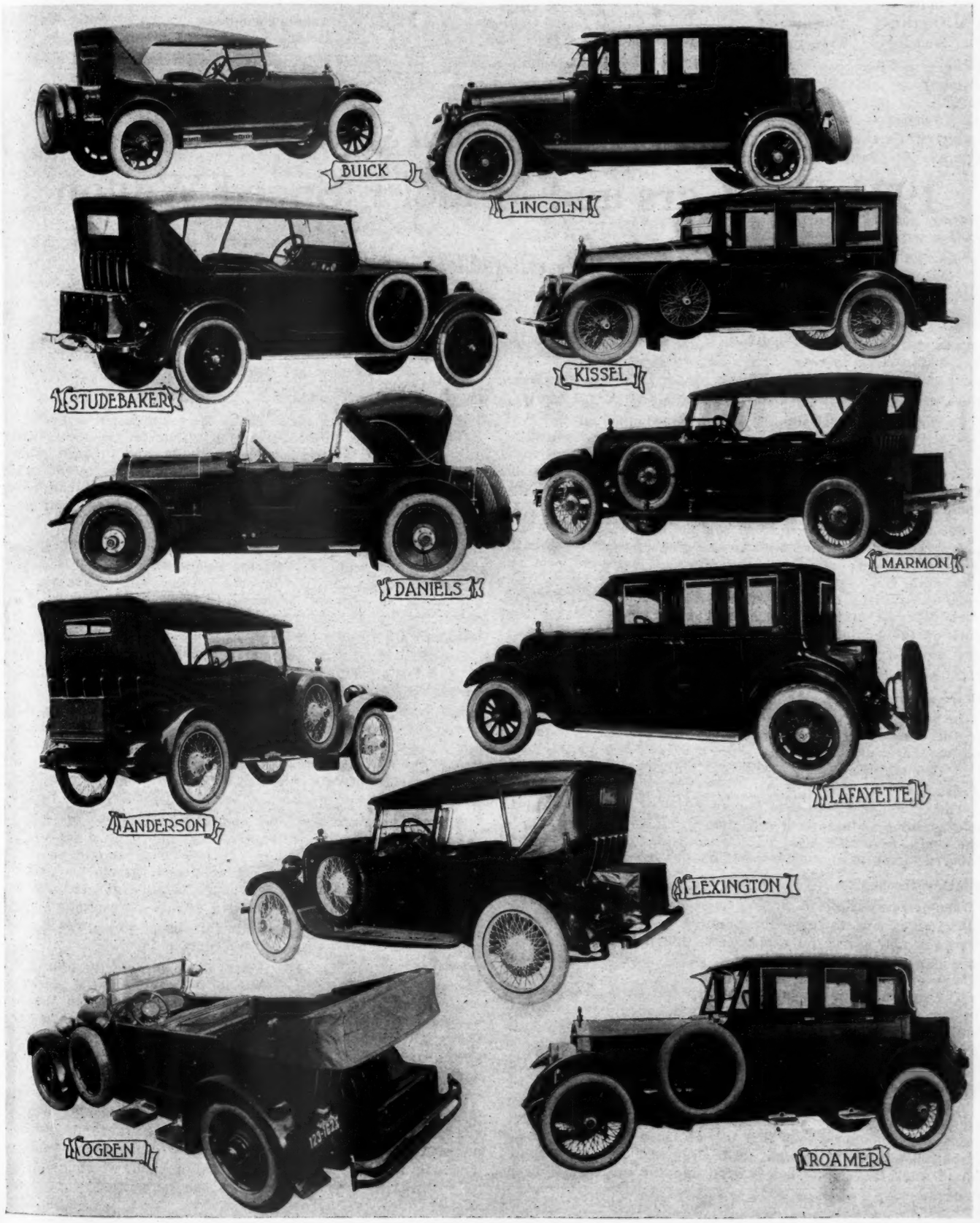
The average automobile dealer will admit without argument that he is interested in anything which concerns his business. Can he contend, in justice to himself that he has no interest in the big problems of the world and nation even though, from a cursory examination, they may seem far afield from his shop or show room?


LUBRICATION CHART FOR FORD CARS
FOR USE WITH Stewart FORD SPEEDOMETER
When colors appear on season mileage dials of speedometer, follow out the instructions given here below the respective color Refer to Lubrication Chart for location of places and parts to be greased.
OIL.
GREASE
OIL.
GREASE
OIL.
GREASE
OIL.
GREASE

New Stewart Speedometer for Fords Shows When to Lubricate

A NEW model Stewart speedometer for Fords, mechanically identical with the present line, has an additional feature of colored dials on the season mileage opening. There are several different colors which appear at intervals of 100, 200, 500, 1,000 and 5,000 miles, each interval being a different color. A chart which is furnished with the speedometer shows the parts of the car that require attention at these intervals, and so that the chart may be more easily used, the colors are used on the chart, too. In addition to indicating the parts that should be attended to, the chart gives explicit directions as to the kind of lubricant and exactly the operations to be gone through to complete the operation.

TRUNK MOUNTINGS ON CURRENT MODELS
Who Sells the Trunk?



This List Will Be a Time Saver When an Electrical Problem Comes Up on Any of the Cars Described

The following electrical systems have been described in previous issues:

Car	System	Issue
1921 Ford	Ford	Nov. 10, 1921
1921 Dodge	North East	Dec. 1, 1921
1921 Buick	Delco	Dec. 15, 1921
1921 Overland	Auto-Lite	Dec. 29, 1921
1921 Studebaker	Wagner and Remy	Feb. 16, 1922
1921 Chevrolet FB & 4-90	Auto-Lite and Remy	Mar. 9, 1922
1920, 1921, 1922 Maxwell	Simms-Huff & Auto-Lite	Mar. 23, 1922
1921 Oldsmobile Six, 37-A and B; 1921 Oakland, 34-C	Remy	Apr. 13, 1922
1921 Oldsmobile, 4 & 8 Cyls.	Auto-Lite and Remy	Apr. 27, 1922
1921 Hudson	Delco	May 18, 1922

North East Electrical System on
1921 Reo Cars and Model F Speed Wagon

Diagnosing and Correcting Electrical Troubles Made Easy by This Simplified and Practical Analysis

ARTICLE ELEVEN of a Series by A. H. PACKER

THE North East electrical equipment used on the Reo motor cars and Speed Wagon, is similar on the two types of vehicles except that the two-wire system is used on the Speed Wagon while on the touring car the grounded system is used. A few differences will be noticed when Fig. 1 and Fig. 2, which show the two wiring systems, are compared.

For example, in the grounded system, the fuses and switch for lighting circuits are both in the live or positive circuit, while in the two-wire system the fuses are in the positive line while the switch and ammeter are in the negative line.

On the touring car the ignition, starter and generator are each separate units, the generator being located on the left side of the engine, while on the speed wagon the ignition unit is mounted on the generator and both are located on the right side of the engine.

Starter Circuits

In both models the positive side of the battery is connected to the starting switch through which the current goes to the motor, the return being by a short piece of cable in one case, and through the frame of the car in the other method of wiring.

The starter is mounted at the right side of the transmission, and contains a single gear reduction in its own housing, while the chain drive to a large sprocket on the front of the transmission, gives it another reduction.

Starter Mechanism

The drive by chain to the transmission turns a large sprocket which is free to turn, but mounted on it is a V-type pulley in which a friction cable rests, this pulley being linked to a pawl which is normally out of engagement with a ratchet wheel on the transmission shaft.

The operation of the starter switch not only gives current to the motor but tightens the friction cable on the V-type pulley so that when the large sprocket turns, the V-type pulley lags behind a bit and has the effect of throwing the pawl down into engagement with the ratchet, thus cranking the engine.

Adjustment of the friction cable is made by means of the nut on the adjusting bolt at the left side of the sprocket. This adjustment should be such that the mechanism engages quickly but should not be so tight as to drag and cause a clicking sound after the engine has started and the switch has been released.

Locating Starter Trouble

If failure of the starter to crank the engine is of a mechanical nature it can be located by inspection, for the motor will turn when the starter switch is operated, and in most cases a minor adjustment only will be required. If the motor fails to operate, however, showing electrical trouble, it can best be located by turning on the lights and watching their appearance when the starter switch is pressed.

LIGHTS GOING OUT shows a poor connection which is not usually bad enough to affect the lights when only this small current is being drawn from the battery, but puts them all out when an attempt is made to work the starter. The most likely place for trouble of this kind is at the battery terminals where acid creeping up from the cells has corroded the terminals so that they make poor connection with the battery posts. This may be the case even if the terminals are on so tightly that it is difficult to get them off.

To test for this condition, it is well to step on the starter button for a few moments and then quickly feel of the various terminals and connections, and if one is noticeably hot, that is the one that is causing the trouble, the remedy being to remove the terminal and either scrape or sandpaper the surfaces that make contact.

A more accurate test and one which is more reliable is to use a low reading voltmeter, say one with a 0-3 scale, although a 0-15 scale meter will do. This should be connected across the suspected contacts, and the starter button should be operated while the meter is so connected. With normal conditions there will be a barely perceptible movement of the needle, but if the meter shows a reading of one or two volts it shows a very bad contact.

LIGHTS STAYING THE SAME while the starter button is operated shows an open circuit in the cables to the starting motor or else in the motor itself, and this condition can also be analyzed by means of the voltmeter. First connect it at the battery, and if a reading is obtained connect from the starter switch to negative battery, then with the starter switch held down test from negative battery to the motor side of the starter switch, and finally across the motor terminals.

The open circuit will then be between the last place where a reading was obtained and the first place where there was no reading, and if there is a voltage reading at the motor terminals it shows an open in the motor itself, which requires its removal in order that repairs can be made.

Trouble of this kind will usually be found due to the brushes being worn down so that they do not touch the commutator, and when new ones are installed it is usually well to true up the commutator which is often somewhat rough by the time new brushes are needed.

LIGHTS GETTING DIM when the starter button is operated may show that the battery is discharged or that there is a short in the motor that draws a heavy current or that there is mechanical trouble in either the starting motor, the drive or the engine.

To test the battery it is well to use a hydrometer, readings being taken at all three cells, and if the readings are about 1280 then the battery is charged, assuming, of course, that no one has added heavy acid or dope of any kind to the cells.

If this is suspected, a check should be made on each cell with a voltmeter, while the starter button is held down, and if the readings of each cell or any one cell should be less than 1.7 it shows that cell to be in a discharged condition. In making this test it may be found that one cell shows either a very low reading or perhaps a reading in the wrong direction and in this case it shows the cell to be shorted and in need of rebuilding with new separators.

If such a condition should be encountered, all cells should be reinsulated, for the others may go bad at any instant if they are not taken care of.

If the battery is found to be O. K. and the motor will not crank the engine, it would be well to put a high reading ammeter in series with the starter circuit, and see what the current draw is.

Most engines require from 125 to 150 amperes to crank them, so that if the current is in excess of 200 amperes it is due to shorts in the motor or to mechanical trouble. If the engine can be easily turned by hand, and the starter mechanism is apparently O. K. it would be well to remove and examine the motor itself.

Removing Starting Motor

The starting motor, starting switch and operating mechanism is mounted on a bracket supported at three points from the frame of the car, one point being on the left side and the other two points being at the right.

Instead of removing the whole mechanism it is easier, however, to remove the motor only, which can be done as follows: Between the motor itself and the starter switch will be seen two nuts on studs which are set in the starting motor.

These nuts should be removed and the studs unscrewed with pliers carefully used so as not to injure the threads. These studs, however, will usually come out with the fingers after they have been started. With these studs removed the starter can be lifted straight up, and then toward the center of the car, so that the chain can be slipped off and the starter entirely removed.

Repairing Starter

In Fig. 3 are shown the internal circuits of the starting motor used on both systems, except in the two-wire system the U-shaped ground strap shown on the upper terminal is omitted.

Another motor similar except that the terminals are in line with each other at opposite ends of the motor is also used, but the circuits are similar. It is known as No. 3581A. Starting motor trouble is usually found by inspection. One exception is the existence of grounds in fields or armature. These can be located by means of a 110-volt circuit with a lamp in series with one side of the line so that test points used when connected to each other light the test light.

With such a circuit hooked up, connection can be made with one test point on the frame of the machine while the other

FIG. 1—WIRING DIAGRAM OF THE 1921 REO

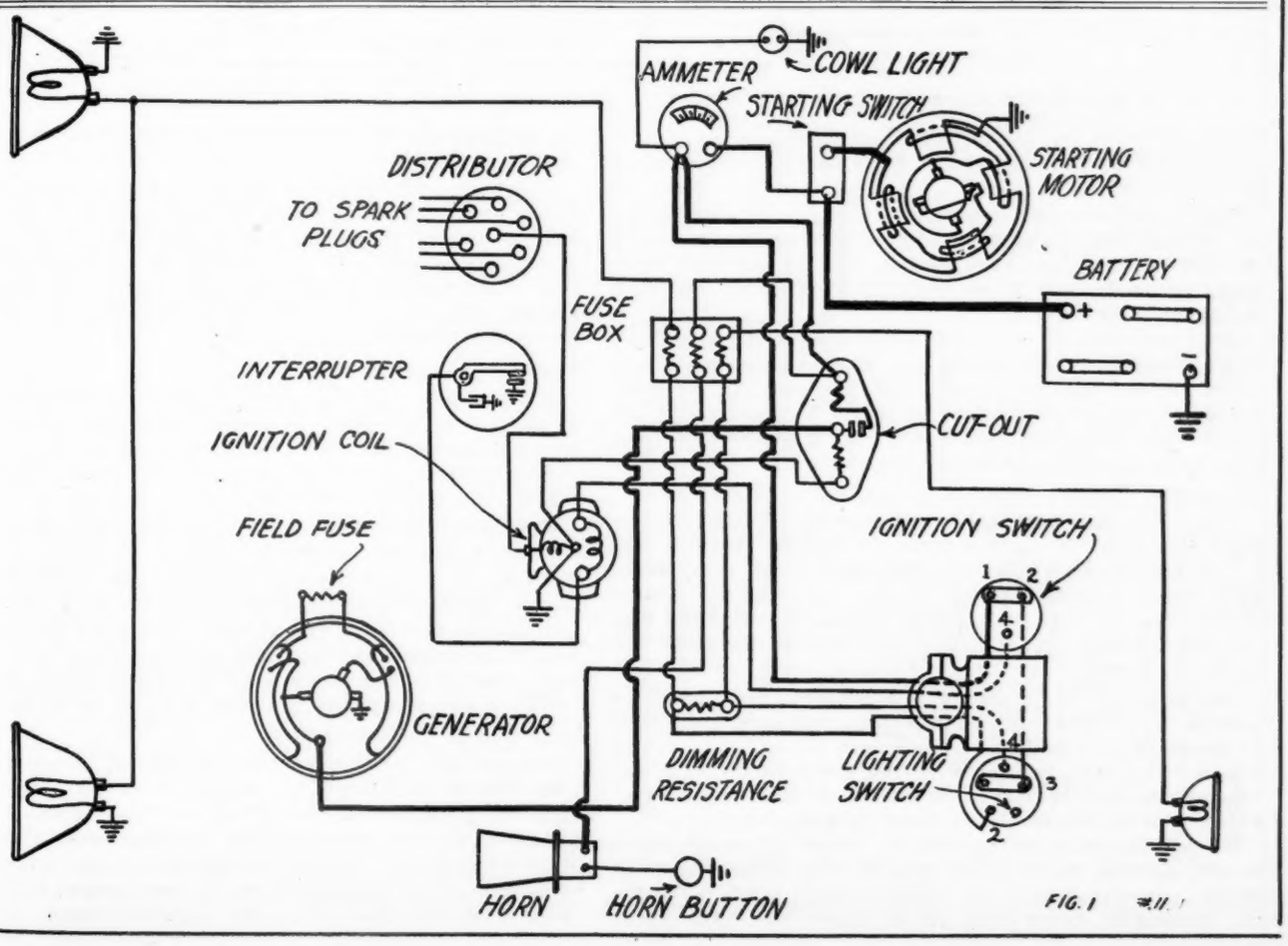
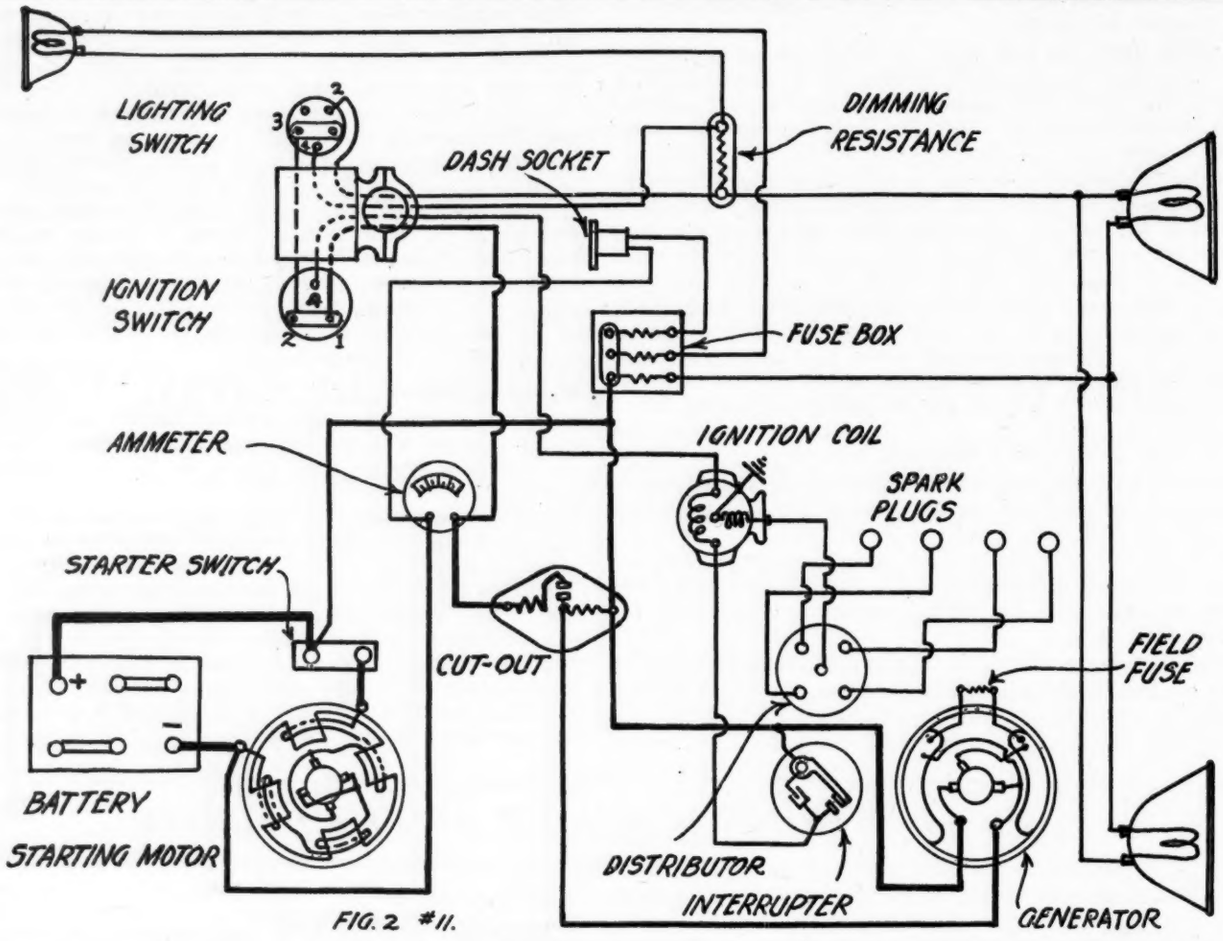


Fig. 2—Wiring Diagram of the 1921 Reo Speed Wagon, Model F



is touched to the brushes, terminals, etc. In testing the grounded machine, the U-shaped ground strap on the upper terminal should first be removed.

If armature and fields test free of grounds, the commutator seems to be well soldered, the commutator surface is smooth and the brushes make good contact, and the armature turns easily by hand, there is not much likelihood of trouble when the motor is installed.

STARTER LUBRICATION is taken care of by three ball oilers, one at the commutator end of the motor, one at the other end, and one between the small sprocket and the housing of the gears. It is also necessary to occasionally put soft grease in the gear housing of the motor, a small pipe plug being removed for this purpose.

Generators (Touring Car)

Two generators are used interchangeably, a two-pole machine shown in Fig. 4 and a four-pole machine shown in Fig. 5. In the two-pole generator, one main brush is grounded by a metal strap on the end bracket, while the field circuit is from the insulated main brush through the left-hand field coil, then through the field fuse, and through the other coil to the third brush.

The output of this generator is adjustable by changing the position of the third brush which can be done from the outside by loosening the two lock screws shown in the left sketch in Fig. 4. The adjusting screw at the lower part of the end bracket can then be turned to get the desired output, after which the lock screws should again be tightened.

The adjustment is accomplished by means of a small pinion on the adjusting screw, which meshes with a few gear teeth cut in a circular segment on which the third brush is mounted. Turning the screw to the left or counter-clockwise, moves the brush in the direction of rotation and therefore increases the output.

THE FIELD FUSE is used for the purpose of protecting the generator from burning up in case the connection between it and the battery should be broken while the car is running. A six-ampere fuse is the correct size to use in the field circuit. Each field coil of this generator draws nine amperes at six and one-half volts while when motoring the generator draws four amperes.

Four-Pole Generator

The four-pole generator shown in Fig. 5 has the main brush at the bottom grounded by a connection that comes to the terminal block at the drive end of the machine. Here a short strap completes the ground circuit to the frame of the generator.

From the live or insulated brush at the right of the commutator, a lead goes to the live terminal, also on the terminal block at the drive end of the machine. Inside the frame of the generator a short strap takes the current from the live terminal to the field fuse, through which the field current goes to the upper right hand field coil, through it to the lower right hand coil, then to the lower left coil, then to the upper left hand coil, and finally to the third brush at the upper left hand side of the commutator.

The field fuse for this generator should also be a six ampere fuse. Output adjustment is obtained as in the two-pole machine by adjusting the position of the third brush. On this generator the lock screw and the adjusting screw look alike, being set in a depression in the commutator end bracket just above the center. The lower one of these screws is the lock screw while the upper one is the adjusting screw. All four

field coils in series draw five amperes on seven volts while the motoring current is three and one-half amperes.

Generator for Speed Wagon

This generator is similar to the two-pole machine used on the touring car, except that it turns clockwise instead of counter clockwise and on the commutator end has a casting which holds the ignition unit.

The circuits are shown in Fig. 6, and it will be seen that both brushes are insulated and connect to two live terminals for use with the two-wire system, also the brush lead from the left field coil goes to the right hand main brush instead of to the one at the left. The third brush adjustment in this machine is obtained by first loosening the two small cap screws at the left and right of the ignition bracket.

These are shown in the left view of Fig. 6 and it will be seen that the one at the right is in behind the bracket, but is readily accessible from the side. The adjusting screw itself is at the bottom and is also shown in this view. A six-ampere fuse is also used in this generator.

Cutout

The cutout used with all of these generators is shown in Fig. 7, it having three terminals for the connection to the battery, generator and ground. In the two-wire system the ground terminal is not really grounded, however, but connects to positive battery.

Two windings are used in the cutout, one of fine wire from the ground terminal to the frame which is insulated from the base plate, while the other winding is of heavier wire and connects from the **Bat.** terminal to the lower contact, which is stationary but adjustable.

Locating Generator Trouble on the Car

An understanding of the generator action and its connections on the car makes it possible to locate the cause of generating trouble before the generator is removed, for failure to show charge on the ammeter is just as likely to be in the wiring or in the cutout as in the generator itself.

This is especially desirable on the Speed Wagon where removal and replacing of the generator also involves watching and checking the ignition timing, due to the ignition being mounted on the generator.

If the ammeter does not indicate any charge current going to battery when the engine is running, it is well to either remove the cutout cover and close the points by hand or else connect from the **"Bat"** to **"Gen"** terminal outside of the cutout.

This should allow the generator to draw current from the battery, the discharge being from 15 to 20 amperes. If the field fuse is removed before this test is made, a heavy discharge current on the meter will show that the armature circuit is not broken, as would be the case if a brush were stuck and not touching the commutator.

With the armature circuit O. K. and the cutout points still held closed, the fuse can be replaced, which should slightly increase the discharge reading if the field circuit is O. K. The spark obtained as the fuse is lightly touched to the clips will also show the field circuit to be unbroken.

With field and armature circuits O. K. the engine should be started and the discharge reading on the ammeter should decrease to zero and swing over to the charge side of the meter, a good generator with third brush properly set giving about 18 amps. to the battery. If readings have been obtained, as above indicated, but when running the engine the ammeter reading will come up to zero but not go over and show any appreciable charge, it usually indicates an armature that is either shorted, grounded or open.

If on first closing the cutout points no current was indicated on the ammeter, it would show an open circuit which is most easily located by the use of a six-volt test lamp.

In the grounded system on the touring cars a test would now be made by connecting one side of the lamp to the frame of the car while the other lead would be used to make contact at various parts of the circuit starting at the battery.

Tests should be made and the lamp watched, touching at the positive battery terminal, then at the starter switch, the ammeter, and finally at the **Bat.** terminal of the cutout.

If the lamp lights up at each of these places it shows the battery circuit is O. K. as far as the cutout. The cutout points should then be closed to see if the lamp will light at the generator terminal. If it does and no current flows it shows an open circuit in the generator, while if it does not light it shows a break in the wire from the generator to cutout.

When the generator charges O. K. with the cutout points closed it is sometimes found that it will not cut in by itself and this may be due either to a defective cutout or to poor connections in the generator which prevents its building up on its own residual magnetism.

In this case it would be well to run the engine and use a voltmeter at the generator terminals to see if there is voltage

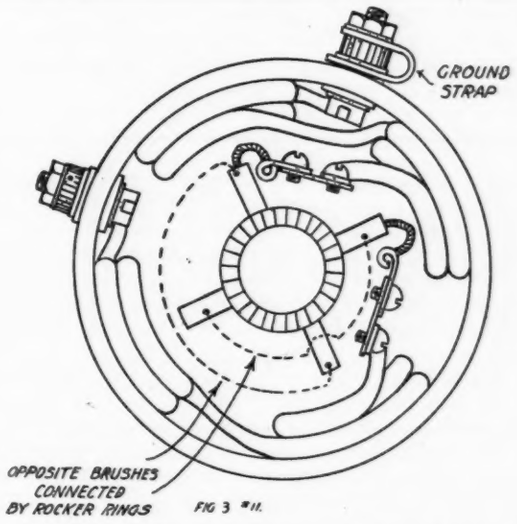


Fig. 3—North East starting motor No. 3581, 1921 Reo. View from commutator end

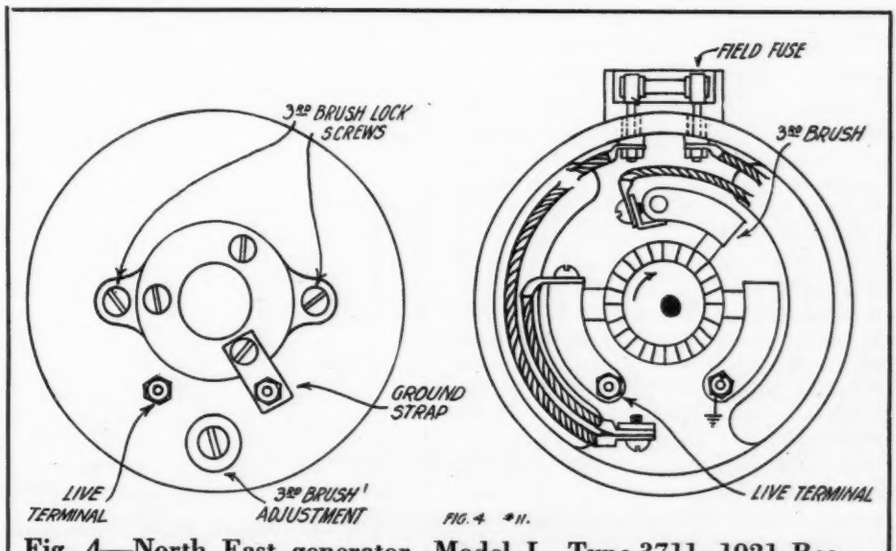


Fig. 4—North East generator, Model L, Type 3711, 1921 Reo

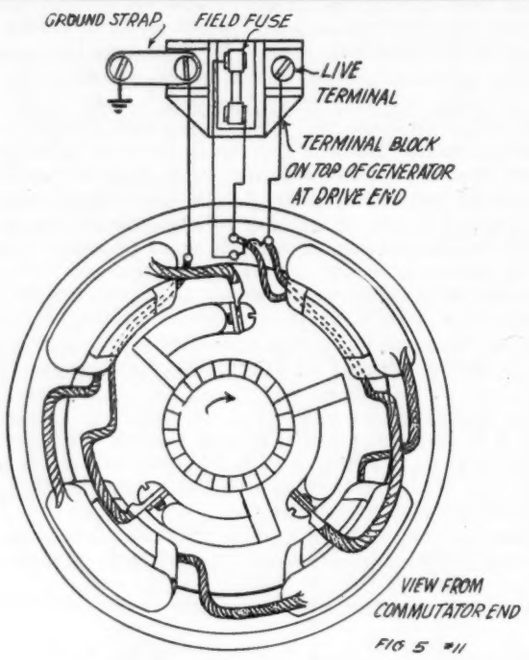


Fig. 5—North East generator, model LR, type 3819, 1921 Reo

there. If a reading of eight volts or more is obtained at moderate engine speed and greater speed sends the meter off the scale, there is nothing wrong with the generator.

With voltage O. K. at the generator the voltmeter should next be connected at the **Gen.** and ground terminals of the cutout, and if voltage is obtained at the cutout and it shows no signs of closing it is possible that the shunt or fine winding is open.

To check this the wire can be removed from the ground terminal and the voltmeter connected to this wire and this terminal so as to put the meter in series with this circuit, then with the engine running, failure to get a reading on the voltmeter shows the shunt winding in the cutout to be broken. Under these circumstances a new cutout should be used.

In making these tests on the two-wire system the negative lead from the battery, to ammeter and cutout should be considered as the live line, while the positive wire to the starting switch, cutout and generator should be considered as the ground return. The same tests can then be made as with the grounded system.

Lighting Circuits (Touring Car)

In Fig. 1 current for the lights comes from the starter switch to the ammeter and through the meter to the No. 1 terminal of the ignition side of the Ignition and Lighting switch mounted on the steering column.

If the switch is taken apart and each side turned down so that the wires can be inspected, the appearance will be as in the diagram. The current then goes across the short wire from the No. 2 terminal on the ignition switch to the No. 3 terminal of the lighting side of the switch.

IN THE DIM position of the switch connection is made to the No. 4 terminal which sends current through one of the fuses to the tail light. Current can also go through the dimming resistance and one of the fuses to the head lights.

IN THE BRIGHT position connection in the lighting switch is made from the No. 3 terminal to both No. 2 and No. 4 so that current can go to the tail light as before, but now does not have to go through the dimmer to get to the head lights so that they will light up at full brightness.

TROUBLE IN LIGHTING CIRCUITS can usually be determined by studying the diagram and the symptoms. For example, if one head light only is out, it could not be due to a blown fuse but might be the bulb, the socket in the lamp or the wire to that one lamp, while if both are out, the fuse is the most likely place to find the trouble.

A blown fuse, however, should not be replaced until the circuit is checked for grounds, the most likely place being in the lamp socket itself where a stray strand of wire may be touching the shell of the socket, or else the wire to the lamp may have its insulation cut by some metal part of the car.

If none of the lights will work it is more than likely that the trouble is in the main lead from the starter switch through the ammeter to the lighting switch, or perhaps in the lighting switch itself.

Ignition Circuits (Touring Car)

With the Ignition switch turned on current goes from No. 1 terminal to No. 4 terminal and then to the ignition coil, then through this coil to the interrupter and across the contacts to ground. The opening of the interrupter contacts causes sudden demagnetization of the iron core in the ignition coil thus producing the high voltage in the secondary winding, which being connected through the distributer to a spark plug gives the spark that fires the gas.

Locating Ignition Trouble

If the engine will not run when there is gas in the tank it is quite likely that there is no spark at the plugs. This is easy to determine by removing a wire from one of the plugs and holding it near the engine while the ignition switch is turned on and the engine turned over.

If there is no spark the ammeter should next be observed to see if it shows the current taken from the battery when the interrupter points close, for under normal operating conditions, the ammeter should show an unsteady discharge current of two or three amperes.

If no current is observed with the engine turning over, it is most likely that a wire in the ignition circuit is broken or disconnected.

If such a condition is not apparent on inspection the break can be located with a six-volt trouble lamp connected from the frame of the car to various parts of the circuit.

In making this test it is well to start at the battery and

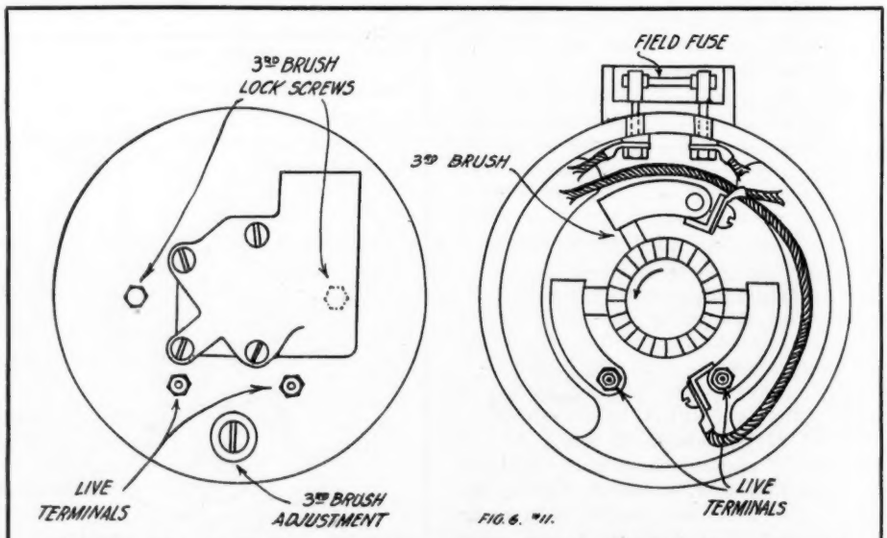


Fig. 6—North East generator, type 3806-L-4, 1921 Reo Speed Wagon, model F

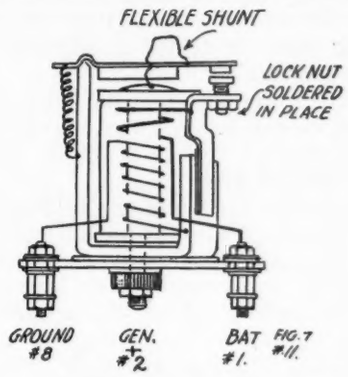


Fig. 7—North East cutout, 1921 Reo

by referring to the diagram work along the ignition circuit until a place is found where the lamp does not light. The break will then be in between the last place where the lamp lights up and the first place where it fails to do so.

If the primary circuit is O. K. and the make and break is shown on the ammeter, and only a faint spark can be obtained at the spark plugs, it is possible that the condenser is shorted.

This can be determined on the car by blocking the interrupter points open and connecting a voltmeter in series with the primary circuit at the coil, by removing one wire from the coil and connecting it to the meter, and connecting the other meter terminal to the coil terminal.

Then with the ignition switch turned on a reading on the meter shows a defective condenser while no reading shows it to be O. K.

If the condenser is shorted it can easily be replaced by removing two nuts under the ignition head and disconnecting the leads inside, and a new condenser will make the sparks as good as ever.

If the condenser is O. K., however, and the primary circuit is also made and broken properly, and still the spark is poor, then a new coil should be used. A good spark is considered to be one that out in the air will jump a 3-16-in. gap without missing.

If the spark misses occasionally but usually jumps a good distance, it may be due to the interrupter points being burnt or in need of replacement, or may be due to the coil beginning to get weak.

Locating Ignition Trouble (Two-Wire System)

In the two-wire system the location of trouble is similar except in checking up an open in the primary circuit. In this case the trouble lamp would be connected first at the battery, then with one lead from the lamp left on the negative terminal, the other could be touched at the starter switch, the ground terminal of the cutout and at the side of the interrupter that is connected to the generator. If the lamp lights up all the way it shows this circuit is O. K.

The lamp can now be connected at the positive battery and the other lead used at the starting motor terminal, then at the ammeter, the ignition switch, the ignition coil and finally at the interrupter. Proceeding as above indicated, an open in either side of the circuit would be located.

Ignition Timing

When it becomes necessary to change the timing, it can be done by means of the adjustable cam. With the engine set on No. 1 firing dead center, the distributer cap can be removed and the rotor or distributer arm also taken off, and in the center of the ignition shaft a round nut will be seen which when loosened two or three turns will allow the cam to be turned on the shaft.

The upper part of the shaft has two flat sides, and several flat scalloped washers fit over this part of the shaft. When the nut is turned down these washers are spread so as to bind tightly on the inner surface of the cam locking it to the shaft.

With the cam loose the rotor can be replaced and the cam turned until the rotor is under the segment that connects to the No. 1 spark plug. For exact setting the cam should also be just ready to open the contacts.

The rotor can now be removed and the round nut tightened and the rotor and cap replaced. Before considering the job finished, however, the engine should be turned exactly two revolutions and the ammeter watched to see if the hand just drops back to zero when the engine dead center point is reached.

This second and final check is desirable to make sure that the cam or the workman did not slip in making the original setting of the cam.

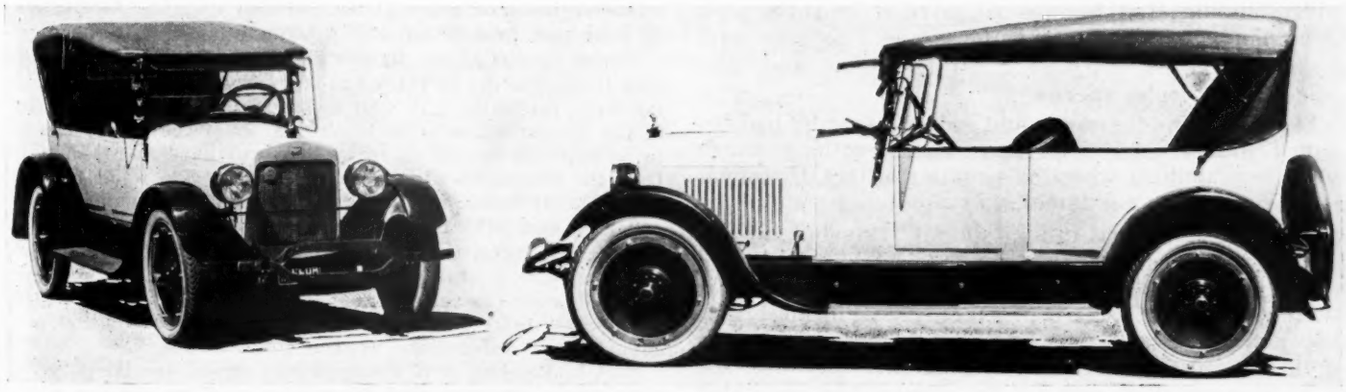
Trask Detroit Steamer Announced at $1,585

MANUFACTURE of the Trask Detroit Steamer has been started in the plant of the Schlieder Mfg. Co., Detroit, manufacturers of valves. The first of the product, a touring model, priced at $1,585, is now being exhibited in the lobby of the Detroit Board of Commerce.

O. C. Trask, president of the Detroit Steam Motor Corp., is in charge of manufacturing at the Schlieder plant.

The car has a 115-in. wheelbase and weighs 2,000 lbs. The two-cylinder engine is directly connected with the rear axle. It is declared to develop the equivalent of 45-50 h.p. Control of the car is by the throttle on the steering post. A distributor organization is being developed.

Dominion Steam Motors has been formed in Windsor to handle the sale of the car in Canada.



Two views of the Trask Detroit steamer. It has a wheelbase of 115 in. and weighs 2,000 lbs.

MOTOR AGE

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Ethics in Racing

IT was a subject of general comment at the Speedway race last week that there was a great need of the injection of ethics into the racing situation.

The story was freely told around the track that Murphy had subjected himself to considerable criticism by ignoring his contract with the Duesenberg interests. Apparently Murphy obtained the chassis he drove on a conditional purchase from the Duesenbergs, with the understanding that he was to drive it in races as a Duesenberg. After winning the Grand Prix race with the car, Murphy installed a Miller engine and then called it a Murphy special.

This name for the car would indicate that he had designed the car and that there was something worth while new about it when, as a matter of fact, there was no reason for such a name.

There were several other "special" cars but on last analysis the men whose names they bore had little or nothing to do with design of the car. It was a matter of some comment that Cliff Durant was formerly the driver of a Chevrolet special and now he is the driver of the Durant special. It seems in that case that the name given to these cars are the same as the car which the young man is engaged in marketing, rather than in keeping with any type of design. Only recently this name fooled a Durant car distributor into advertising this as a stock car. A dealer might make the same error about the Leach.

The ethics are quite different in other branches of sport. In horse racing, for instance, the pedigree of the horse is always known and to be guilty of hiding the facts is quite a serious offense.

Evidently it is time for some one to take hold of the situation and formulate some rules adequate to govern the situation. If this is not done, there is a danger that automobile racing, as a sport, will lose entirely the confidence of the public. Also, the engineers deserve credit for their work.

What Laymen Know

HOW much the car owner knows about cars is a question of much dispute within the industry. Some contend that the laymen knows more about the various makes of cars than the average man within the industry, especially salesmen and others on the dealers' staffs. Others assert that the layman knows little or nothing about cars but has heard some wise remarks that he can repeat now and then or use as a basis of asking questions.

Probably both of the above statements are correct, for there are a lot of laymen in this country. It must be remembered that there are about 11,000,000 vehicles in this country and while a large number of these are licensed to men within the industry, the number in the hands of laymen is much larger. It is doubtless the case that a good many of these persons are "wise" as to automobiles and from the very fact that they do not owe a definite allegiance to a certain vehicle would give to them an opportunity to make a superficial study of all cars.

When seeking information as to what the public knows, the inquirer is very apt to pick out such persons as will prove his case for him and regard them as representative. But what follows here is probably a fair test. A Chicago Tribune reporter asked five persons:

"What do you think is a needed improvement on the automobile?"

You can form your own opinion as to the soundness of the opinions advanced. However, it is self evident that some of the persons interviewed were not nearly as well up on American automobiles as they thought they were. The five answers to these questions follow:

Arthur J. Haggenjos, 17 North La Salle street, attorney—A four wheel brake system is a needed improvement that, for safety's sake, ought to be designed and applied to every car of whatever make or class. I got the idea from the description of some new foreign car, and it strongly appeals to me.

Joseph C. McCaffery, in charge of vehicle license bureau, City Hall—The car of today has been developed to a point not far from perfection. In that sense they might be compared to the classic styles of architecture. So if the future car is to be superior to that of today they will have to redesign it from the ground up. I wouldn't be surprised to some day see a completely redesigned car driven by a turbine engine.

Peter Lenz, 3752 Belmont avenue, clerk—One of the most annoying features, both to driver and passenger, is the jerks of the car due to shifting of the gears. The steam driven car has it all over the gas car in that respect. If they are really as good as their champions say they are, then the steam car ought to be developed and popularized.

Paul L. Blockus, 1048 North Mozart street, special police—Well, if by the waving of the magic wand we can get what we want, then let's have a fool-proof, punctureless tire, one

having all the resiliency of the hollow rubber one; oil and grease cups so placed that we won't have to roll around under the car to oil up; have universal good roads; drivers that keep their feet on the pedals and their arms around the steering wheel instead of around some girl.

Warren T. Schild, 4232 North Lincoln street, millinery salesman—It seems to me that the various classes of cars have been developed to a point where they are all but perfect. I read not long ago that mechanical experts throughout the world are generally agreed that the mechanical part of the car is all but perfect. I'll venture this suggestion—hypnotize all cars so that they will refuse to run when the driver has any booze in him.

Parcel Post Rates Under Consideration

PERSONS and firms that use the parcel post extensively will be interested in the statement that the rates for this sort of transportation are to undergo a revision. The following statement is made by the Chamber of Commerce of the United States:

> Parcel-post rates must be increased, the Postmaster General states.
>
> The increased costs of handling parcel-post mail necessitates a corresponding advance in parcel-post rates, the postmaster general announces, who at the same time is writing to a large number of parcel-post users to get their views on the proposed change. Since January 1, 1913, when parcel-post service was instituted, there has been practically no change in the rates of parcel-post service. Then the parcel-post business comprised less than 5 per cent of all the mail handled; now it is more than 60 per cent, the department says. The cost of railroad mail transportation has increased 60 per cent, salaries of assistant postmasters 65 per cent, city delivery carriers 35 per cent, railway mail clerks 74 per cent. Large increases have been made in the salaries of rural route carriers and others in the service. These increases amounted to more than $300,000,000 for 1921 above those of 1913. Two remedies have been suggested: (1) to enact a service charge of one or two cents on each parcel mailed, regardless of weight or zone; (2) to readjust rates by weight and zone.

If you have an opinion on this subject write it to the Postmaster General.

More Need for Education

AUTOMOTIVE dealers in Canada have a real job cut out for them in that they have for an opponent, the Canadian government, which is advertising in behalf of the horse breeding industry. The Canadian government, it would appear from extracts from the advertisements, is not exactly ethical in some of the statements. An ethical advertiser should content himself with stating the merits of his own goods, but these advertisements attack the merits of trucks and tractors. The following is quoted from one of the advertisements:

> "During the war years there was a material falling off in quality and size of Canadian horses. Proper attention was not given to the breeding of good horses. *People were misled into the idea that trucks and tractors were more profitable.* Labor was scarce and very costly. Feed was high. Greater production of foodstuffs was imperative. Cost of production was not considered."

This sort of advertisement appears to be especially unfair under the present circumstances. There was a time when tractor merchants and manufacturers in their enthusiasm encouraged talk about the horseless farm. Recently, however, as the tractor has been improved there has been a recognition of the fact that the horse still has a place on most farms and the tractor manufacturers have been quite content to let old Dobbin go his more or less peaceful way.

Evidently there is an opportunity for education among the higher-ups of the Canadian government.

The Object of Advertising

THE advertising managers of the automobile factories have announced a meeting to be held in Chicago, when they will discuss for their mutual benefit the general subject of advertising automobiles. The announced topics indicate that the discussion will include almost every phase of the question, except that of the influence the advertising will have on the sale of cars.

It seems more than passing strange that in arranging this program, no dealer was asked to talk to the factory managers on this all-important topic. It is the dealer who knows how the factory advertising affects the buying. He is the man who meets the customer and who must get the future owner to part with his cash. A dealer's opinion on what sort of advertising helps and what actually brings the customer into the show room would be intensely interesting, and, we do not hesitate to say, surprising to many factory advertising managers.

Recently Norval A. Hawkins, in an address to the Michigan Dealers Assn., was quite critical of some of the advertising of automobiles as it is being done today. Evidently, Mr. Hawkins had been talking to some dealers on this subject, as dealers generally comment favorably on his somewhat cutting remarks.

The factory advertising men formerly held such meetings as this one announced to take place in Chicago on June 13. The reports of those meetings, as published, were devoted largely to the mechanics of advertising; how costs were distributed and how they may be lessened. It would seem that these items are comparatively unimportant until the big question as to what effect advertising has on the prospective prospect has been determined. And this question will not be answered as long as the advertising managers commune among themselves. If they could draft a few live dealers and guarantee them immunity because of comment they might make on the policy of the companies they represent there would be an opportunity of a consultation worth while.

Someway it appears very difficult for those in high positions in this industry to comprehend the importance of the dealer.

Can You Afford to Be Without—*A Good Workbench?*

THE other day we had a chance to visit a shop wherein one of the racing cars for the Indianapolis race was being groomed. It was a revelation to note the cleanliness, the neat arrangement of machinery and tools and particularly the fine workbenches. One immediately associated the place with excellent machine work and first class mechanics.

The benches were built of heavy timbers, painted gray and were covered on top with zinc. The tops were beautifully clean and only the immediate job being worked upon was in sight on the bench. There was an incentive for the workmen to do good work. How could they do otherwise? The shop was airy and light. Floors were clean, tools were kept orderly and everything shipshape.

Why should not a dealer's shop be likewise?

Detroit Factories Keep Up Schedules

Some Preparing for High Production Through Summer

May Believed to Have Been the Largest Manufacturing Months in the Industry

DETROIT, June 6—Heavy manufacturing schedules effective in most Detroit plants during May will be carried through into June without any sign of abatement. The first signs of a drop in business are not yet to be discerned, and a number of factories have begun to place committments on a basis which indicates expectancy of a continued forced manufacturing schedule in July and August.

May, in the opinions of leading executives in most plants here, has been the largest manufacturing month that the industry has ever known, but it is declared there may have been other months in which shipments were larger, owing to stocks carried over. Because of the existing lower scale of prices it is said the total value of shipments may also be somewhat under some former record months, but as a production month, they assert, it has taken first place.

A conservative idea of the speed at which some leading factories were operating at the month end is shown by the following statements:

Ford on a 4,300 daily basis, with the May schedule of 120,000 production assured.

Dodge, on a 600 daily basis.

Maxwell, on a 400 daily basis.

Durant, (Lansing) 100 daily basis.

Studebaker (all plants) 440 daily basis.

Hudson-Essex (both makes) 275 daily basis.

Paige-Jewett (both makes) 160 daily basis.

Cadillac, 150 daily basis.

Wills Ste. Claire, 60 daily basis.

Packard, single six, 50 daily basis.

Hupp built and shipped 3,662 cars in May, the largest manufacturing month it has had. **Earl Motors** reached a production of 65 daily at the end of the month and is continuing. The Briscoe line has been practically closed out except for some roadster and coupe models and the company will soon be in position to devote itself entirely to the production of the standard Earl line.

Rickenbacker built and shipped 500 cars in May, bringing the total of its cars now on the road to 1,400. A schedule of 750 cars has been mapped out for June. **Columbia** shipments in both models show large gains over April, but output in the single-six line was still handicapped owing to difficulty in getting material deliveries. **Lincoln,** also handicapped by material shortages, was operating at a rate of 30 cars daily.

Reo Motors reports business to be continuing steadily with an output of about 130 daily divided between cars and speed-wagons. **Handley-Knight** and **Roamer,** Kalamazoo, reports business in May to be increased over April and indicating a continued growth in June. **Liberty** reported May business to be larger than any previous month the company has known with orders for immediate delivery assuring capacity output in June.

Oldsmobile output reached a new daily mark in May and had a total production for the month approximating 4,000.

Production on the **Gray** car was delayed owing to inability to get factory equipment installed and delay in material deliveries. Work on the factory addition is being rushed and will be completed June 15, officials said. No figure has been set for production in June, but the company will get into operation as fast as conditions permit.

The new plant of the Durant company at Lansing which will be devoted exclusively to the manufacture of the Star will be completed in July and production will be started there in August. Officials said 100 of the new light car will be built at Long Island City plant in June, with large production to start in July.

1,700 Attend "Ask 'Em to Buy" Meeting in Brooklyn

Brooklyn, June 5—The "Ask 'Em to Buy" meeting held in Kismet Temple here Friday night and addressed by Ray W. Sherman, merchandising director of the Automotive Equipment Assn., was attended by 1,700 automobile dealers, garage owners and other persons connected with the automotive industry. This was the largest meeting yet held in the "Ask 'Em to Buy" movement, Sherman said. The meeting was presided over by Judge James A. Dunne and after the lecture and the showing of the "Ask 'Em to Buy" film, a lunch was served.

STUDEBAKER'S BEST MONTH

South Bend, Ind., June 5—President A. R. Erskine, of the Studebaker Corp., announces that the production, sales and financial departments of that company broke all previous records in May. Sales were approximately 14,000 cars and production 10,853 cars. Sales for May, 1921, were 7,383.

HEAVY TRUCK SALES

Mount Pleasant, Mich., June 6—The Transport Truck Co. reports that the total number of orders for Transport trucks placed by distributors for April delivery exceeded the number in any previous April in the company's history.

Lafayette to Reorganize Under Control of Nash Co.

New Corporation to Take Over Assets and Liabilities, Following Failure of Pierce-Arrow Merger

NEW YORK, June 5—Reorganization of the Lafayette Motors Co. under the direct control of the Nash Motors Co. will be voted upon by the stockholders of the former at a special meeting to be held at the Hotel Belmont in this city on June 20. This plan was decided upon soon after the abandonment of the contemplated merger with the Pierce-Arrow Motor Car Co.

Stockholders will be asked to authorize the sale of all property to the Lafayette Motors Corp., a Maryland corporation. The new company, which will be under the same management as the Lafayette Motors Co., will have a capital of $3,000,000 in 7 per cent first preferred stock of $100 par value; $4,000,000 in 7 per cent second preferred of $100 par value and 30,000 shares of common of no par value. This will exceed by $2,000,000 the capitalization of the old company, but the directors feel that the $2,000,000 additional capital is required.

The Nash company has advanced the Lafayette Motors Co. approximately $500,000 in addition to endorsing bank loans of about $1,000,000. Because of this assistance, about 80 per cent of the common stock of the original Lafayette company was transferred to Nash.

A Lafayette balance sheet as of March 31 last shows the following assets: cash $206,350; accounts receivable $82,578; merchandise $612,808; prepaid expenses $9,459; land, building and equipment $1,558,967, making a total of $2,470,164.

The liabilities were: notes payable $1,440,000; accounts payable $29,191; dealers' deposits $21,750; accrued liabilities $56,388, making a total of $1,547,329, leaving the net worth of the company $922,834.

The Lafayette Motors Co. was organized in 1919 and erected a modern plant at Mars Hill, a suburb of Indianapolis. It was unfortunate in getting under way just as the business depression began. It sold approximately 1,000 cars, but general business conditions were such that its outlay far exceeded cash returns.

Charles W. Nash, president of Nash Motors, has been president of the Lafayette company and a majority of the members of the board of directors have been Nash directors. They included Nash, James J. Starrow of Boston, chairman of the Nash board, and Frederic W. Allen of New York.

Nash will continue to direct the affairs of both companies.

May Production Near April Figure

Truck Companies Merge As Industrial Motors Corp.

Selden and Atlas Concerns Said to Be Nucleus of Plan to Consolidate Large Manufacturers

ROCHESTER, N. Y., June 5—The Selden Truck Corp. of Rochester, and the Atlas Truck Corp. of York, Pa., are to be consolidated in a new corporation to be known as the Industrial Motors Corp. of Delaware according to plans which were approved unanimously at a special meeting of the board of directors of the Selden company held in Rochester last week. Letters have been sent out recommending acceptance of the plan by the stockholders.

A group of New York capitalists composed of John J. Watson, Jr. chairman of the Pierce Oil Co. and president of the Lee Tire & Rubber Co., Frederick M. Small, president of the Martin Parry Co. and Reeve Schley, vice-president of the Chase bank, who are already interested in various branches of the automobile industry are connected with the undertaking, according to a statement made by George C. Gordon, president of the Selden company.

The Industrial Motors Corp. is being organized and incorporated under the laws of the State of Delaware to acquire the control of a selected number of old and reliable concerns now engaged in the manufacture of motor trucks and the major units used in their assembly and to establish throughout the country assembling plants and supply stations for the economical manufacture and distribution of motor trucks and parts whereby purchasers may be assured of prompt and permanent service at all times.

The plan is to put forward a specialized motor truck composed chiefly of standard units now widely recognized. The bringing together of large manufacturers of this type of motor truck will provide a method of effecting the greatest economies in the purchase of raw materials and supplies, lower the cost of production and greatly increase the efficiency in manufacturing merchandising and distributing, according to officials behind the movement.

TO HEAR WILLYS CLAIMS JUNE 19

Toledo, June 5—Federal Judge Killits has set June 19 as the day for a conference here of all persons interested in the litigation by which the receivers for the Willys Corp. hope to establish claims for more than $5,000,000 against the Willys-Overland Co., as well as in a counter claim of the Overland company against the corporation for $5,107,766 for materials supplied the Electric Auto-Lite Corp.

Negotiations for a settlement out of court have been under way for some time but were abandoned a few days ago. It is estimated that the claims of the corporation are considerably in excess of those filed by the Overland company.

"Harmony and Ethics in Automobile Business"

CHICAGO, June 5—The Chicago Automobile Trade Assn., through its ethics committee, has issued a letter to all members of the association urging them to see that members of their sales organization do not deliberately disparage or knock the cars handled by competitors.

"When we disparage a competitor, either privately or publicly, we discredit our industry, and when we discredit our industry we discredit ourselves," the letter says.

The ethics committee of the association is reviving the old creed of the association and will provide every member with a copy, with the request that it be framed and hung on the wall "so that the whole world may know there is harmony and business ethics in the automobile business."

RACINE TIRE CO. REORGANIZED

Racine, Wis., June 5—Reorganization of the defunct Racine Auto Tire Co., of Racine, Wis., by a new corporation known as the Racine Horseshoe Tire Co., has been completed by eastern financial interests which have a working arrangement with the stockholders and Racine and Milwaukee banks. The new officers and directors which have taken over the management are: President, J. C. Lawrence, of S. W. Straus & Co., Chicago; Vice-president, O. D. Hollenbeck; secretary and sales manager, L. H. Shepherd; treasurer, Raymond H. Weins, Racine.

AUTOCAR NAME UPHELD

Philadelphia, June 6—The right of the Autocar Co., Ardmore, Pa., to the exclusive use of the word Autocar in the manufacture and sale of motor vehicles has been upheld by an injunction issued by the United States District Court for the eastern district of Pennsylvania against the Peters Autocar Co., of Bethlehem, Pa., and De Veillier & Co.

NATIONAL PRICE REDUCTIONS

Indianapolis, June 5—The National Motor Car & Vehicle Corp. announced price reductions in the National models, effective June 1. The 7-passenger phaeton is reduced from $2750 to $2375. The new prices on other models are: 4-passenger phaeton, $2475; 3-passenger roadster, $2475; Newport 22, phaeton, $3025; Newport 22, 7-passenger, $3150; 4-passenger sedan, $3250; coupe, $7325; 7-passenger sedan, $3825.

Slight Decline in Output In Closing Days of Month

Not Due to Lack of Orders But to Holiday, Scarcity of Material and Labor Shortage

NEW YORK, June 6—Production of motor vehicles fell off slightly in the latter days of May. It was due to the Memorial Day holiday, inability to get adequate supplies of certain essential materials and a shortage of skilled labor, rather than to a falling off in orders Total output for the month prosises to be only 10,000 or 15,000 less than for April and it probably will reach 200,000 cars and trucks.

Notwithstanding the disappointment which will be felt because May did not establish an indisputable high water mark, company after company in the passenger car field is reporting that it was the biggest month on record. This applies alike to large, medium sized and small plants. To all intents and purposes the industry is operating at capacity and it undoubtedly was true, speaking generally, that May was a better month than April. This was especially true in the parts field.

June opens with every promise of closely approaching the May mark. There is no noticeable dimunition in the volume of orders. Sales at retail in virtually all parts of the country are gratifying alike to manufacturers and dealers. Rapidly improving conditions in the south and the prospect of an early opening of the real buying season in the agricultural sections of the middle west offer much encouragement. These and other factors promise to prevent any sharp seasonal midsummer slump in sales.

Peak production and the avid demand for motor vehicles have brought manufacturing difficulties in their wake. Probably the most serious of these is labor. A shortage prevails in all branches of the industry and is responsible in large measure for the shortage of some essential part. The companies hardest pressed to meet orders have been placed in the position of bidding against each other for help and this is forcing wage scales upward with a consequent increase in costs which will more than offset the prospective savings on freight rates. The situation in this respect appears most acute in the tire field but parts makers are little better off.

Another factor which has increased production costs somewhat has been the willingness to pay premiums for immediate deliveries of some raw materials, especially malleables. This is the result of refusal to place committments for more than one or two months ahead.

Harold F. McCormick Resigns as President of International

Is Succeeded by Alexander Legge, Vice-President, Once Collector in Omaha Branch

CHICAGO, June 3 — Upon the retirement of Harold F. McCormick from the presidency of the International Harvester Co. yesterday, Alexander Legge, vice-president and general manager, was elected to the presidency by the board of directors. McCormick, whose retirement was voluntary, was elected chairman of a newly created executive committee of the board of directors.

Legge has been with the company for 30 years, having started as a collector for the Omaha branch of the old McCormick Harvester Co., which was later absorbed by the International. Later Legge became manager of the company's branch at Council Bluffs, Ia., and when Harold F. McCormick, as a young college graduate, started out to learn the business he was sent to Council Bluffs. There he became closely associated with Legge. Shortly after McCormick returned to Chicago in 1897 Legee was brought here and made manager of the collection department of the company. He advanced steadily.

For a number of years Legge has been in charge of the sales of the company and probably will continue to exercise close supervision over that department. His election to the presidency does not mean any change in administrative policy, for he has been virtually the operating head of the company for a number of years. McCormick issued a statement saying that as chairman of the executive committee he did not contemplate any diminution of his interest in or service to the company.

The directors were given an encouraging report of the company's business. Nearly all of the tractors which have been an inventory burden for two years were reported sold, although at some loss. Prospects were said to indicate a large volume of business and satisfactory earnings for next year.

Other members of the new executive committee are: Cyrus H. McCormick, chairman of the board of directors; Legge, William D. McHugh, general counsel, and John P. Wilson, consulting counsel.

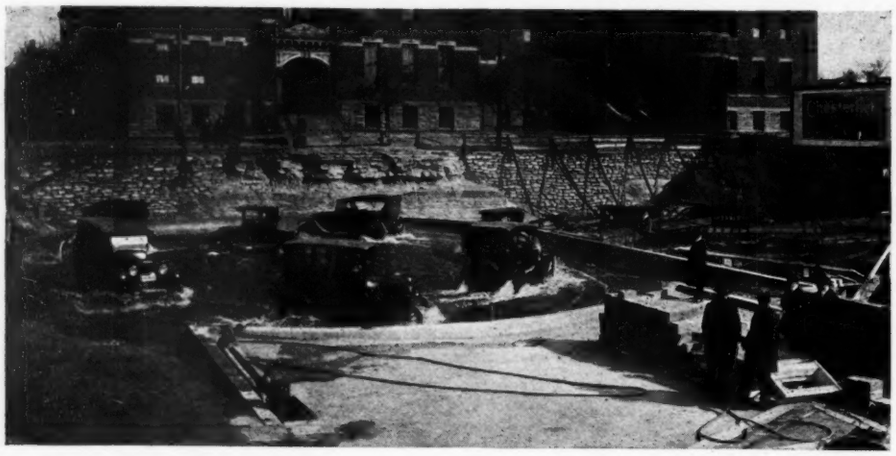
Persons Who "Just Dropped In" Buy Automobiles

CLEVELAND, O., June 5 — Ready sale of high priced automobiles to persons who "just dropped in" without having previously been in contact with a salesman, is an unusual feature of the automobile business noted by R. H. Collins, president and general manager of the Peerless Motor Car Company. Collins says that the Peerless distributors report that they are making such sales every day.

CADILLAC SALES GAINING

Detroit, May 29—The sale of Cadillac automobiles this year up to May 1st were two and a half times the volume for the corresponding period of last year, according to H. H. Rice, president and general manager of the Cadillac company.

A Wash Bowl for Automobiles



ST. PAUL, Minn., June 5—A large concrete wash basin for automobiles has been constructed here by the Service Station Construction Co., which plans to put this method of washing cars into operation throughout the country. The bowl is 81 ft. long and 63 ft. wide and the water varies in depth from 5 in. at the edge to 17 in. near the center. The car to be washed is driven into the water and driven around the bowl in the water at an appropriate depth until the wheels and frame are clean. At the leaving point the car is sprayed with forced water, which cleans the body, and an electric dryer finishes the job. The charge for this service is 25 cents. If wiped dry and polished, 50 cents extra.

Jimmy Murphy Gets $33,700 for His Victory in Indiana

Prizes Awarded at Annual Drivers' Banquet—Hartz Gets $10,000 and Trophy

INDIANAPOLIS, June 6—At the annual drivers' banquet, held Wednesday night, at which the men who piloted victorious cars received their awards for the 500-mile race, a total of $70,575 was distributed, in addition to the three trophies.

James Murphy, winner, received $33,700 for his five hours' work and the Wheeler Schebler trophy. His winnings were: $20,000 speedway first prize, $5,000 from the Delco company for being first with that equipment, $6,200 from the lap prize fund, and $2,500 for winning on the Oldfield tires.

Harry Hartz got the $10,000 speedway second prize, $2,500 from Delco, $1,675 from the lap prize fund, and $1,500 for being second with Oldfields. He also got the Prest-O-Lite trophy.

Peter De Paolo received $100 of the lap prizes, and Leon Duray got $50 from this source.

The third prize offered by Delco went to the seven drivers who came in behind Hearne, because his car was not equipped with this device. Each of the seven received $150.

The dinner was given by the Speedway and other automotive interests and was complimentary, in honor of the winners. T. E. Meyer presented the Speedway checks. A. H. Adams, who has headed the committee which has raised the lap prize fund for the last three years, presented the lap prize checks. Barney Oldfield presided, and Harry Miller, designer of the winning engine, and Louis Chevrolet made short addresses.

R. & V. HAS BEST MONTH

East Moline, Ill., June 5 — R. & V. Motor Co's business in April increased 37 per cent over the March business, according to D. M. Beal, salesmanager, who adds that field reports indicate that June may surpass the May record, which was the largest in the history of the R. & V. organization. This is the biggest selling season in the 18 years of the R. & V. operation.

Increased enclosed car business in April jumped 42 per cent over March, while the general increase in the automobile field was only 20 per cent.

AVALON RUBBER CO. SOLD

Akron, June 3—By order of Referee in Bankruptcy Harry L. Snyder of Akron, the Avalon Rubber Co. of Barberton was sold for $28,500 cash to private interests represented by Fred Lahrmer, Akron attorney. The sale is subject to revision and stockholders have served notice they will file a petition of revision within 10 days.

National Automobile Assn. Organizers to Meet June 19

Committee Representing Delegates Who Withdrew from A. A. A. Call Gathering at Chicago

CHICAGO, June 5—A committee representing the delegates who withdrew from the American Automobile Assn. at its annual convention at St. Louis, May 20, has issued a call for all automobile clubs interested to meet at the Sherman Hotel, Chicago, June 19 and 20, to perfect organization of the National Automobile Assn. This committee is headed by Fred H. Caley of Cleveland. Other members are Chas. C. Jones, Columbus, O.; N. E. Noblet, Indianapolis; Richard H. Lee, Chicago; Henry Paulman, Chicago; B. H. Hagerman, Kansas City; Eugene Stuart, Louisville, Ky.; H. R. Keltig, Louisville, Ky.; Ewing S. Mosely, Dallas, Tex.; G. E. Gillespie, Lincoln, Neb.; W. Q. Winship, St. Paul, Minn.; M. P. Lawler, St. Joseph, Mo.; A. G. Lupton, Hartford City, Ind., and Walter D. Meals, Cleveland.

The committee has issued a statement giving its reason for the withdrawal from the American Automobile Assn. and stating that it represents 243,000 individual members of automobile clubs in the following states: Ohio, Indiana, Illinois, Kentucky, New York, Minnesota, Texas, Nebraska, Missouri, Iowa, South Dakota and Wisconsin.

The committee states that the action of the president, Geo. C. Diehl, in permitting the 72 delegates of the Chicago Motor Club to vote on their own eligibility for seats in the convention of the American Automobile Assn. was in direct violation of the association's constitution and led to the withdrawal of the protesting members.

PHILADELPHIA OFFICERS ELECTED

Philadelphia, June 5—At the annual meeting of the board of directors of the Philadelphia Automobile Trade Assn., the following officers were elected: President, Louis C. Block of Louis C. Block, Inc., distributor of Gray cars; vice-president, Ralph W. Cook of the Neel-Cadillac Co.; treasurer, J. E. Gomery of the Gomery, Schwartz Motor Car Co., Hudson and Essex distributors; secretary, Walter G. Herbert of Herbert Bros., Chandler cars; executive secretary, Charles C. Bulkeley. All of these are re-elections, except the case of Cook, who was elected vice-president to succeed Harry B. Harper.

SALES SLIGHTLY LESS

Springfield, Mass., June 7—Sales of cars during May in this territory ran a little behind the April level, which was an extraordinary record. As a whole, the spring season has far exceeded expectations. A continued preference is shown for enclosed models, with an increasing degree of interest in the new coach designs that approach the enclosed in effect. Gains have been manifest more particularly in the sales of cars ranging up to $2,000, with but little change in respect to the higher priced cars as compared with preceding months. In one or two cases, selling has slackened, owing to reports of new models soon to be offered. Some improvement has been manifest in the demand for trucks.

Preparing Highway Text-Book for High Schools

WASHINGTON, June 6—Prompted by the success of the educational outline on highway transport prepared for university use under their direction by Prof. Lewis McIntyre, the officials of the Highway and Highway Transport Education Committee have now turned to Prof. Buckner of the School of Education of the University of Pittsburgh to translate the book into language designed for use by high school students throughout the country.

The new pamphlet will be prepared in co-operation with officials of the United States Bureau of Public Roads, the United States Bureau of Education and other organizations represented on the committee, and will be the first comprehensiv effort to place the subject of highway transport before the high school students of the country.

Mrs. Florence Fox, specialist of educational systems in the Bureau of Education, has been working for several months in the preparation of an outline on highway transport for use by students in the fifth and sixth grades. This work has taken the form of project teaching, by means of which the pupil examines the relation of highway loaction, construction and use to the historical, civic, geographical and economic development of the community in which he lives, as well as learning something of their national significance.

MAY MOON'S BEST MONTH

St. Louis, June 3—Announcing that May was the largest month in the company's history, the Moon Motor Car Co. states that unfilled orders at the end of the month were greater than at the beginning. Sales for May were 126 per cent greater than in May, 1921, and 78 per cent greater than for May, 1920. The best previous month for the Moon company was June, 1920, but May this year exceeded that month by 64 per cent. Production is nearly 50 cars a day.

CARTER ENGINE DEMONSTRATED

Gulfport, Miss., June 6—The Carter Automobile Co. of Gulfport, manufacturer of automobile engines, held a public demonstration of their engine at the plant last week. This enterprise promises to begin quantity production shortly.

Shortage of Skilled Labor Hampers Automotive Industry

Manufacturers Bidding Against Each Other and Large Turnover Results

NEW YORK, June 6—Difficulty in obtaining an adequate supply of skilled labor has become one of the most pressing problems of the automotive indsutry, and the situation is becoming serious in the larger manufacturing centers, particularly Detroit. The trouble is fully as general in the parts field as in the vehicle branch.

In a good many cases automobile manufacturers are practically bidding against each other for labor. Inasmuch as the workers in automotive plants are not organized, there have been no threats of strikes, but the skilled employes not unnaturally are "shopping around" and taking the jobs which offer the best pay. This is resulting in a steadily mounting percentage of labor turnover.

The announcement of a wage increase averaging 10 per cent by the Firestone Tire & Rubber Co. is the most radical step thus far taken in this direction. Present indications are that whatever savings are effected in automotive plants by the reduction in freight rates will be more than offset by higher wage scales if production continues at its present pace.

BURCH HEADS ARROW MOTORS

Sandusky, Ohio, June 3—A. C. Burch, former president of the Signal Motor Truck Co. and later vice-president of the Clydesdale Motor Truck Co., will be president of the Arrow Motors Co., recently incorporated, which took over the assets of the Maibohm Motors Co. The other officers will be Sandusky business men. The directors will include R. E. Hayslett, treasurer of the Hydraulic Steel Co. of Cleveland; E. G. Kirby, vice-president of the Commerce-Guardian Trust & Savings Co. of Toledo and N. T. Brotherton, president of the Brotherton Co. of Detroit.

FORD DEALERS MEET

Greenwood, Miss., June 6—Thirty Ford dealers within a radius of 75 miles attended a district meeting here May 25. The meeting had been called for the purpose of giving general instructions to the dealers and for the discussion of business conditions in the territory represented.

OHIO HAS MOST FORDS

Detroit, June 3—Recent statistics made public by the Ford Motor Co. show that in each of eight states there are more than 200,000 Ford cars and trucks in service. Ohio, with 290,769, has the greatest number. The other states in order are Illinois, Pennsylvania, Texas, Michigan, New York, Iowa and California.

N. A. D. A. Announces List of Fifty-seven New Members

19 States Represented in Additional Roster—Total Now More Than 240

ST. LOUIS, June 5—The National Automobile Dealers' Assn. announces a list of 57 automobile dealers in 19 states who have been accepted for membership in the association since the first list of members was published in MOTOR AGE of May 1. The total membership is now more than 240. Following is the list of new members:

ARKANSAS
Little Rock Motor Car Co., Little Rock.
Shoemaker-Bale Auto Co., Little Rock.

CALIFORNIA
William E. Bush, Los Angeles.
Paul G. Hoffman, Inc., Los Angeles.
M. A. Durkee, Santa Barbara.

COLORADO
H. C. Bradley, Fort Collins.

FLORIDA
Bacon Motors Co., Jacksonville.

ILLINOIS
L. F. Wentzel, Aurora.
Alton Auto Co., Alton.
Wagner Motor Car Co., Belleville.
T. K. Morrow & Co., Belleville
Killeen-Buick Co., Galesburg.
Thos. J. Hay, Inc., Chicago.

INDIANA
R. D. Brown & Co., Indianapolis.
C. H. Wallerich, Indianapolis.

IOWA
McKibben Motor Co., Inc., Cedar Rapids.

KANSAS
Capitol Auto & Supply Co., Topeka.
W. H. Imes Auto Co., Topeka.
Trefry Motor Co., Topeka.

LOUISIANA
H. A. Testard, New Orleans.
Universal Motor Co., New Orleans.
Wray-Dickinson Co., Shreveport.
Bernstein-Glenny, New Orleans.

MISSOURI
Farmer Auto Co., St. Joseph.
Lewis Automobile Co., St. Louis.
Diamond Motor Co., St. Joseph.

NEBRASKA
Lord Auto Co., Lincoln.

NEW JERSEY
Mallon Motor Co., Newark.

NEW YORK
Boulevard Garage Co., Albany.
E. V. Stratton Motors Co., Inc., Albany.
Hudson-Oliver Co., Buffalo.
Associated Motor Sales Corp., Nyack.
Gere & Willis, Inc., Syracuse.
Charles A. Hanna Co., Syracuse.
Stowell Motor Car Co., Syracuse.

OHIO
Bovis Oldsmobile Co., Cincinnati.
Canton Motor Car Co., Canton.
Bliss Auto Sales Co., Toledo.

OKLAHOMA
Greenlease-Moore Cadillac Co., Oklahoma City.
McClelland Gentry Motor Co., Oklahoma City.
Wood-Hurt Motor Co., Muskogee.

PENNSYLVANIA
M. Brenner & Sons Co., Harrisburg.
Hoeveler-Stutz Co., Pittsburgh.
Dauphin Motor Car Co., Harrisburg.
Harrisburg Auto Co., Harrisburg.
Harrisburg Buick Co., Harrisburg.
Guy A. Willey Motor Co., Philadelphia.
American Motor Sales Co., Erie.
Keystone Auto Co., Erie.
Roth Cadillac Co., Erie.
Star Garage Co., Erie.
Cadillac Co. of Harrisburg, Harrisburg.
Roy K. Russell, Warren.

SOUTH DAKOTA
McKinney-Beveridge Auto Co., Sioux Falls.
Thompson Motor Co., Sioux Falls.

TEXAS
Gulf Coast Buick Co., Galveston.

WASHINGTON
Eldridge-Buick Co., Seattle.

Lynn M. Shaw, recently appointed assistant general manager of the National Automobile Dealers' Assn.

GARDNER GIVES SALES INCREASE

St. Louis, June 5—The Gardner Motor Co. announces that for the five months ending June 1, shipments of Gardner automobiles were 220 per cent more than the shipment in the corresponding months of 1921. Orders on hand are said to be sufficient to require capacity production until August 15.

The company reports that sales made by its distributors in a number of cities increased nearly 1000 per cent between Jan. 1 and June 1, as compared with the corresponding period in 1921. Some of the increases were: Kansas City, 992 per cent; Billings, Mont., 980 per cent; New York City, 983 per cent; Atlanta, Ga., 800 per cent; Portland, Ore., 940 per cent; Minneapolis, 640 per cent; Cleveland, 501 per cent.

ASSOCIATION TAKES VACATION

Springfield, Mass., June 7—The Automotive Dealers' Assn. had its final meeting for the season June 6, when reports were given telling of growth of membership and influence during the year. The organization will continue to take an aggressive part in opposing detrimental legislation and looks toward a more ambitious show program for next year. Its annual beefsteak supper took place at the Highland Hotel May 23, when a lively entertainment was put on. The next association gathering will be a clambake some time in August.

Oregon Dealers Have to Pay Property Tax on Cars in Stock

Supreme Court Gives Ruling in Case Contested by Portland Automobile Dealers' Assn.

PORTLAND, Ore., June 5—The automobile industry of Oregon was handed an additional tax burden this week through a decision handed down by the state supreme court. The decision is to the effect that dealers who have cars in their possession held under dealers' licenses when the annual tax assessment date of March 1 arrives must pay personal property taxes on all such cars, in spite of the fact that they have already taken out the dealers' licenses.

The decision will mean that the automobile dealers of Portland and the rest of Oregon will have to pay back taxes in excess of $100,000 for the years 1920 and 1921, in addition to having to pay future taxes as they come due.

The case has been carried forward by the Portland Automobile Dealers' Assn., although filed in the name of the Northwest Auto Co., and has been in the courts for approximately a year.

From the standpoint of the dealers it was argued that personal property taxes should not be paid on the cars, as they had already been taxed under the license system, and that it was expressly provided that such licenses should be in lieu of all other taxes. It was also contended that if the personal property tax was assessed against the dealer this would result in double taxation when the cars were sold by the dealers and private licenses taken out by the purchasers.

The court held, however, that the tax exemption provision provided only to private automobile licenses and not to dealer licenses, and in regard to the second point held that there was nothing to show that cars held by dealers for sale under dealers' licenses might not be sold to residents outside of Oregon or might be kept in garages and not operated and thus not privately licensed. It is estimated by those in the industry that but a small fraction of one per cent of all the cars handled by the dealers in Oregon would come within this last hypothetical class.

The decision has united the automobile men of the state stronger than over in the effort to get the entire tax and license system of Oregon revised to what they feel would be an equitable basis. Under the present system of taxation, including the two-cents a gallon gasoline tax and the state automobile license, and not counting this new burden imposed on the dealers, it is declared the automobile, and particularly the used car of small value, is taxed in greater proportion to value than any other class of property. The decision will probably result in forcing dealers to take out private licenses for all cars which they have in stock prior to March 1 each year, as long as the present law remains unchanged.

Latest Tire Reductions Indicate Price War Is Near

Goodyear's Line at 25 Per Cent Below Standard List Balked Proposed Increase by Others

AKRON, June 5—Although tire manufacturers in Akron and vicinity are trying to minimize reports current for some time to the effect that a tire price war was impending, the introduction by the Goodyear Tire & Rubber Co. of a new cross-rib cord tire to sell at nearly 25 per cent below the standard cord tire market lists, and the announcement by the Seiberling Rubber Co. of a blanket 12½ per cent price slash on Portage and Seiberling straight side tires, on top of the price revisions made by Seiberling the first of May, admittedly have caused an upheaval of no small proportion among tire manufacturers and have upset carefully worked out programs for an anticipated upward revision of tire prices.

The new Goodyear line of tires was introduced at a psychological time to thwart the plans of competitive companies for announcement of tire price increases about the first of May. Introduction of the new lines is considered tantamount to a price cut, in view of the fact that the new cross-rib casings will sell at from 20 per cent to 25 per cent below the standard lists of the Goodyear all-weather tread cords and of most other standard cord tire makes.

Almost simultaneously with the Goodyear announcement, Frank A. Seiberling, who founded Goodyear 23 years ago in a dilapidated straw board box factory in East Akron, revised his prices on Seiberling cords down to the standard market lists, and put into effect a 10 per cent cut on all Portage tires.

The combined action of Goodyear and Seiberling has forced a change in the plans of other rubber companies which are known to have had new price lists drafted and ready for the printers. And these new price lists embodied substantial increases.

One Akron company feverishly developed a new tire to sell at prices competing with the new Goodyear tire. It was submitted to hurried tests and then it was discovered that the tire was too good to sell for so low a price, and that it could not be profitably marketed to compete with the lower priced casings. Realizing the futility of putting another high grade and high priced tire on the market, the company has about decided to abandon the new tire completely.

The Amazon Tire & Rubber Co. has put out a new cord tire to sell at fabric prices. Firestone has increased the dealers' marginal profit and has made a slight reduction to the consumer.

Officials of other companies here decline to comment upon the Seiberling price cuts or on the new Goodyear line. Yet each is watching the other—alert for new developments in the price war, and waiting for the other fellow to make the first move. In other words it is the old "Watchful Waiting" lid clamped down upon a situation that is liable to break forth with the torrent of a volcano and to further disrupt the price situation.

Manufacturers last year took heavy inventory losses, slashed prices about 40 per cent and barely breezed through. Sales today are larger than a year ago, partly because prices were cut three and four times—approximately about 40 per cent in all. The sales in dollars are considerably lower, however, although the sales in units are larger.

HANSON CO. BUYS FACTORY

Atlanta, Ga., June 6—The American Motor Co. of Jacksonville, Fla., has been purchased by the Hanson Motor Co. of Atlanta, it is announced. Each concern is capitalized at $1,500,000. The result of the taking over of the Florida concern, which had a plant for the manufacture of automobiles, will be an increased production by the Hanson company, it is understood.

AUTO-LITE SALE POSTPONED

Toledo, May 29—No one appeared to bid for the Electric Auto-Lite division of the Willys Corp. at the sale scheduled at the County Court House today and the sale was postponed until June 7 by Receivers Frank P. Kennison and Francis G. Caffey.

CITROEN WINS ECONOMY TRIAL

Paris, May 29—A new model overhead valve Citroen four-passenger car won the Lemans fuel consumption trial, covering 100.5 miles with an allowance of 1.49 gallons of gasoline at a minimum speed of 25 miles an hour.

HART-PARR TRACTORS REDUCED

Charles City, Ia., June 5—The Hart-Parr Co. announces that the price of its Model 30 tractor is reduced from $1,295 to $895 and its Model 20 from $945 to $765.

Two Pontiac Companies See Good Prospect for Summer

May Business of Oakland and General Motors Truck Co., Was Best in Two Years

PONTIAC, Mich., June 6—May business at the Oakland Motor Car Co., in actual shipments of cars from the plant, exceeded April output by 50 per cent according to W. R. Tracy, assistant sales manager. Tracy says that the business in May was 125 per cent greater than that in May, 1921, and was the largest single month since September, 1920.

During June, he said, it is the present prospect that there will be at least a 50 per cent increase over May's record, as orders ahead promise necessity of speeding up the production.

"While there may be a little let-down in July," said Tracy, "the outlook is for a very good fall, and we anticipate big business in August, September and October. The farmers have not yet really begun to buy, and when they begin to cash in on their produce you will see a strong fall demand for motor cars."

W. L. Day, general manager of the General Motors Truck Co., declares May to have been the biggest month in the plant's record since 1919, when it was exceeded by only one or two months. This summary is based on orders received. Special equipment orders have held back shipment somewhat, but there has also been a large increase in shipments over the April record and any previous month since 1919.

"We base our opinions of the market and the prospects for coming business," Day said, "on the dealers' weekly retail reports. These have been showing a steady improvement for a long time and we are consequently feeling confident of the future prospect. There doesn't appear to be any let-up ahead. Orders now in hand and commitments made point to a still stronger production month in June."

Sales of M. A. M. A. Members Show Gains for Four Months

New York, June 3—The following table shows the sales by members of the Motor and Accessory Manufacturers' Assn., the total of past due accounts and the total of notes held, for all the months of 1921 and first four months of 1922:

Month	Total Sales	Per Cent Change	Total Past Due	Per Cent Change	Total Notes Outstanding	Per Cent Change
1921						
January	$ 6,264,587		$8,099,727		$4,359,871	
February	10,408,962	66.16 Inc.	6,717,165	17.07 Dec.	6,063,118	39.08 Inc.
March	20,120,386	93.60 Inc.	5,603,992	16.57 Dec.	5,069,877	16.38 Dec.
April	26,746,580	32.93 Inc.	5,352,271	4.49 Dec.	5,371,086	5.94 Inc.
May	26,781,350	.13 Inc.	4,505,176	15.64 Dec.	4,460,355	16.77 Dec.
June	22,703,414	15.19 Dec.	4,720,973	4.79 Inc.	4,012,670	10.37 Dec.
July	23,096,214	1.68 Inc.	5,242,046	10.79 Inc.	3,690,154	7.90 Dec.
August	23,397,640	1.31 Inc.	4,348,790	17.06 Dec.	3,494,510	5.30 Dec.
September	23,141,891	1.09 Inc.	4,358,545	.22 Inc.	3,677,500	5.24 Inc.
October	22,053,327	4.70 Dec.	4,512,680	3.54 Inc.	3,463,500	5.82 Dec.
November	18,998,490	13.85 Dec.	4,352,000	3.56 Dec.	3,661,900	5.73 Inc.
December	14,349,750	24.47 Dec.	4,220,450	3.02 Dec.	3,384,250	7.58 Dec.
1922						
January	$17,320,000	20.61 Inc.	$4,450,000	5.45 Inc.	$3,146,000	7.02 Dec.
February	22,720,000	31.17 Inc.	4,070,000	8.57 Dec.	3,483,000	10.74 Inc.
March	28,670,000	26.14 Inc.	2,890,000	28.86 Dec.	2,657,000	23.69 Dec.
April	33,830,000	18.07 Inc.	3,000,000	2.00 Inc.	2,500,000	1.5 Dec.

Lean Period Gave Impetus to Revised Dealer Systems

Extensive Sales Organizations Developed During Depression Promise New Methods

DETROIT, May 30—Sales plans as being developed by leading companies in the Detroit district will result within the next year or two in the establishment of merchandising systems which will control very definitely the problem of reaching the prospective buyers of cars as it has existed up to the present point in the industry.

The development of such systems, though long regarded as necessary to insure the solidity of the industry as a whole, was compelled to await the arrival of a long period of depression, before they could be worked out and tested at length. The recent period presented the opportunity and the present season is witnessing successful demonstration of the systems.

Ford Motor Co. officials, with the factory working at the highest production pitch it has ever known to keep pace with demand, ascribe the present rush of business to a thorough sales canvass made throughout the country in the dull period of last winter. At that time the sales force in every section was assigned the task of getting a definite idea of sales prospects, especially in the farming districts.

Nothing Left to Chance

Sales today are said by officials to be really sales made during this canvass. Dealers were given exact knowledge as to where sales might be expected and were enabled to place their efforts where they would be most effective. There is nothing "chancey" about the business that has developed, though that it has been heavier than was expected even by the Ford interests, is shown in the fact that the factory is working six full days weekly, where it had been planned to adopt permanently the five-day week.

Throughout its business career the Ford company has been benefitted materially by the numerical strength of its dealerships, and also by the extensive sales staffs that have always been maintained by its dealers. Now by the adoption of Ford methods in the multiplication of its dealers and salesmen, the Studebaker company has risen to a foremost place among the medium price car makers.

Though both the Ford and Studebaker distribution is handled through the branch system, those factories which depend on distributors for the turnover of their product are coming out for increased dealerships and more salesmen. Territories formerly held by one distributor are being subdivided into many smaller sales sections, with a dealer on the spot to keep in immediate touch with the district.

Recently General Motors has gone in energetically for the subdivision of territories and the placing of dealers at points where the volume of sales was not considered up to possibilities. An intensive system of covering a territory is being developed by the advisory staff through the medium of one of its Detroit branches, which when perfected will be recommended for standard practice by all dealers handling General Motors lines.

Under this system every listing of residents compiled for any municipal, national, business or other reason will be consulted and analyzed for information which will be helpful in promoting sales. Dealers will be instructed in the lists to consult, how they may be obtained, the analysis of them, and how to use the information which they may be found to yield.

20,000,000 Is Price of U. S. Automobile in Poland

WASHINGTON, May 27—Twenty million for a nice little nifty American-built automobile is the latest quotation in Poland on American-built cars. The quotation is marks, of course, and the trade commissioner in Warsaw cables the Department of Commerce that at this price there are but three or four people in Poland who buy a first-class American car. The price of gasoline is 55 marks a gallon, the equivalent to about 25 cents. About 6,000 cars are reported to be in use in the whole of Poland.

FIRESTONE INCREASES WAGES

Akron, June 3—The tire industry in Akron faced a new upheaval and a wage war as well as a tire price war today when the Firestone Tire & Rubber Co. announced a wage increase averaging 10 per cent to become effective immediately for all its factory employes. Firestone is the first rubber company to increase wages following the comeback staged by the entire industry. Officials of other rubber companies admit they are surprised by the Firestone action but will make no comment as to the future action of their own companies. On good authority, however, it is learned that at least one other of the major plants will announce a wage increase and that another will take action tantamount to a wage increase by reducing the hours of factory shifts and continuing the same pay.

Firestone also increased salaries of office workers 10 per cent.

MORE WORKERS AT DETROIT

Detroit, June 3—Members of the Employers' Association added 2,831 workers to their payrolls in the week ended May 27, bringing the total to 166,937. This is 50,000 more than for the corresponding week of 1921 and within 20,000 of the total for the corresponding week of 1920.

Hall Says Depression In Tractor Industry Has Passed

Machines Perfected and Attention Must Now Be Given to Solution of Farm Problems, He Says

MINNEAPOLIS, June 5—The tractor having reached the apex of its evolution, the tractor industry now can turn its attention to the farmer problems, said Guy H. Hall of Chicago, speaking before the Northwest Tractor Trade Assn. May 29, in Minneapolis. Hall, who is head of the National Institute of Progressive Farming, said the tractor industry has been so wrapped up in technical matters of development of the business that little time had been found to study the problems of the farmer. Tractor manufacturers and dealers must stimulate their interest in these matters if they are to stimulate their own business, he said. Both he and President J. E. Gardner of the association pointed out that the next great field for entrance by the tractor industry is to aid the dairy farmer.

Gardner said the dairy farmer is more in need of the tractor than the grain farmer. "The dairy industry is growing tremendously and it is our opportunity to study dairy farming needs and to show how thoroughly the tractor can help meet them," he said.

Hall said the depression in the tractor industry has definitely passed and in 1922, with the finest machine they have had, manufacturers and dealers cooperating are sure to have one of the best years in their history. To accomplish this the chief need is organization. The tractor trade has not been thoroughly organized. Manufacturers and dealers have not worked together. Both have failed to work closely with the farmer, but now, with proper unity, they have a big opportunity before them. He urged the trade to cooperate with the American Farm Bureau Federation in its education and promotion work and in turn gain the ear of the farmer to explain the merits of the tractor, which would be unquestionably appealing if the farmer knew and also understood its use.

GRANT-WALKER MERGER DROPPED

Cleveland, June 3—Talk of a merger of the Grant Motor Car Corp., the H. J. Walker Co. and the Standard Equipment Co. has ceased and the deal has been declared off by reason of the cancellation of an order for engines that had been given the Walker company by a large manufacturer of motor cars.

FORD EXPORT ASSEMBLY PLANT

Norfolk, Va., June 5—A party of engineers representing Henry Ford and headed by Col. Mayo, has inspected the site which it is reported has been tentatively selected as the location for the principal Ford assembly plant of the Atlantic coast for export trade.

IN THE RETAIL FIELD

Colonial Automobile Co., Hartford, Conn., Studebaker, distributor, captured the Group One Studebaker dealer cup for making the greatest number of sales during the month of April.

B. F. Goodrich Rubber Co. has established a branch house in Fort Wayne under the direction of Harry E. Powell and Gates D. Horton.

R. H. Long Motors Co., has opened a salesroom at Hartford, Conn., under the management of H. H. Balcom, formerly of Hartford. The Bay State is now being displayed in the former Pierce-Arrow salesroom.

Aaron G. Cohen, Hartford, Conn., has erected a new, brick, steel and concrete sales and maintenance building and has organized the Lexington Hartford Co., to handle the Lexington in Hartford county.

Fred W. Dart, Inc., Hartford, Conn., succeeds the Palace Auto Service Co. and will continue to represent the Mitchell carried by the old firm. A new sales building is now in process of construction on the new automobile row, Connecticut boulevard, East Hartford. Fred W. Dart, head of the concern, is the oldest dealer in Hartford.

Kentucky-Duesenberg Motor Car Co., Louisville automotive field, has opened an office and salesroom.

F. B. Wilcox Motor Co., new Chevrolet dealers, has opened its new sales and maintenance station at Minneapolis. Every visitor was given a ticket covering prizes to be distributed at the end of the week, May 27. C. J. Copelin is general manager and A. V. Nelson is superintendent of service.

Maxwell Co. has entered into a contract at Spokane, whereby the Maxwell will be handled by the Logan-Grant Co., which, since 1915 has distributed throughout the Inland Empire approximately 1,500 Chalmers cars.

Wilcox-Buick Co., Pontiac, Mich., has changed its name to the Pontiac Buick Sales Co., and the force has been enlarged so as to include Merle G. Thompson of Pontiac, and Jack Mallory of Flint, Mich., both well known in automobile circles of this section.

Three Ohio Associations Plan to Work in Harmony

Columbus, O., June 5—The slight friction which has existed between the Ohio Automobile Assn., the Ohio Good Roads Federation and the Ohio Automobile Trade Assn. has passed away, and at the annual meeting of the former organization held in Columbus recently all joined forces in working for better roads. There had been a feeling among the members and officers of the Ohio Automobile Assn. that the Ohio Automobile Trade Assn. and the Ohio Good Roads Federation were actively opopsing some of its pet measures for the benefit of motorists, and friction ensued.

Another meeting of representatives of the three organizations will be held soon, when steps to boost a comprehensive good roads program in Ohio will be formulated. The plan is for all matters of legislation affecting owners to be handled by the Ohio Automobile Assn., matters of legislation affecting dealers and garagemen will be handled by the Ohio Automobile Trade Assn. and all three organizations will unite in promoting better highways.

CAR SHORTAGE IN HARTFORD

Hartford, Conn., June 2—With the spring selling season well under way, Hartford dealers are finding themselves short of cars to meet promised deliveries. One dealer who came to Hartford two years ago with a comparatively unknown car which he has pushed hard and gotten into a commanding position in its price class is absolutely unable to get cars for the next two or three months and is to retire from the local field the first of June.

DEALER HAS NOVEL SIGN

Houston, Tex., June 3—The Davis Motor Co., Ford dealers of Houston, have something new in the sign line. In one of the long show cases in the salesroom the words "Genuine Ford Parts" are spelled out with Ford parts. The letters are distinctly formed and the words readable at a glance. Nearly fifty various parts are used in forming the letters, there being no duplication except in one or two instances. The sign attracts immediate attention.

RUPERT B. BRAMWELL DIES

New Brunswick, N. J., June 3—Rupert B. Bramwell, for the last 14 years advertising manager of the Michelin Tire Co., died of pneumonia at his home here last week after a brief illness. He was widely know in the automotive industry.

Bramwell was born in Terre Haute, Ind. in 1876 and entered the automotive industry in 1900 when he joined the DeDion Bouton Motorette Co., which sold the French DeDion car. While with this company Bramwell made the first long distance run on record, motoring from New York to Boston, which was considered a remarkable achievement at that time.

Later he became advertising manager of the Pope Toledo car, after which he devoted himself entirely to advertising. He was connected with the Cosmopolitan, the Scientific American and Leslies and was with the Class Journal organization for about four years.

TAKES OVER CARTER COMPANY

St. Louis, June 3—The plant of the Carter Carbureter Co. in this city has been taken over by the American Car & Foundry Co. and will be operated as its carbureter division. Sales and service will be handled by a separate company known as the Carter Carbureter Corp. with headquarters at the factory.

Hugh H. C. Weed, who was in charge of the old company will also be general manager of the Carter Carbureter Corp. and will have associated with him practically all the old Carter organization including G. M. Bicknell as chief engineer, R. H. Herron as field engineer and H. S. Staton as sales manager. C. E. Burg will represent the company on the eastern coast with headquarters in the offices of the American Car & Foundry Co. at New York and V. G. Lowenstein will cover the middlewest. No representative for the Pacific coast has been appointed as yet.

Transportation Value of Automobile and Railroad Discussed

American Iron, Steel and Heavy Hardware Assn. Points Out Relation of Truck to Locomotive

WASHINGTON, June 2—Use of the automobile in quickly covering large territories and establishing new trade connections at smaller cost for each call than is possible, by railroad transportation, was discussed here this week at the thirteenth annual convention of the American Iron, Steel and Heavy Hardware Association.

S. L. Orr, Orr Iron Company, Evansville, Ind., said that it was difficult to make a precise comparison as to salesmen's costs by automobile and by rail over the country as a whole, but that it was clear that the cost for each call even in sparsely settled territory is less by automobile than it is by train. He also stated that it is possible to form a broader acquaintance by use of the automobile. It developed that a large number of the jobbers have adopted the use of the automobile for their salesmen, both for the purpose of facilitating and increasing their business and to hold down expense accounts. Some jobbers provide the automobile for the salesmen and pay for their operation and maintenance. Others make it optional with their salesmen as to the mode of travel, and when automobiles are used the salesmen are required to provide them, but expense of operation and upkeep is paid by the jobber.

Report Read

A report was read of the motor accessories committee, of which W. S. Roby, S. B. Roby Co., Rochester, N. Y., is chairman, in which the committee urged the jobber to engage more extensively in handling stocks of motor accessories. He said that if they had begun this practice 25 years ago, the industry would be on a more stable basis. He said that the handling of motor accessories has been a difficult problem, but generally is proving profitable.

It was declared that the most unsatisfactory line relates to tires which are sold under guarantee and which often have to be made good. Closely allied with this line are tire chains. It was suggested that it is probable that they will be sold to the jobber and distributed by the latter on a reasonable basis. Suggestions also were made for arranging the accessories in different branches to be handled by the jobber. Among other things, it was proposed that sundries might form one branch and be distributed by the jobber instead of the business being handled exclusively by the garage. Distribution of trim supplies by jobbers was also mentioned, and it was conceded that it might be difficult to draw a distinction between the lines in this branch.

BUSINESS NOTES

Perwell-Kennedy Motor Co., Knoxville, Tenn., has increased its capital from $20,000 to $40,000. The name of the concern has been changed to the **Beaty Motors Co.**

Hydro Battery Co., Memphis, Tenn., has been incorporated with a capital of $10,000. Incorporators are S. J. Smith, J. D. Guthrie, T. T. Skinner, J. G. Bailey, S. G. Gall, and A. W. Donaldson.

Francher & McNairn Co. has been formed by C. H. Fancher, Jr., and E. McNairn to distribute Goodrich solid and pneumatic tires in the Spokane territory.

The Motor Supply Company has been incorporated by Charles Durkoop to handle motor parts ad has been established at No. 1125 First avenue, Spokane. The company has been given the exclusive distribution in the Pacific northwest of Kant Skore pistons.

O. L. Langellier, Clinton, Ill., Ford distributor in De Witt county for many years, has taken a ten-year lease upon a two-story brick building now under construction. When occupied, some time next fall, he will utilize his present plant for storage purposes only.

White Battery Service Station has been opened at Springfield, Ill., by L. A. White and will specialize in electric and lubrication service for motor vehicles.

Zak & Scharafin, Springfield, Ill., distributors for the Federal and Commerce motor trucks, find an increasing demand for such vehicles, disposing of 25 since the first of the year, a record, probably surpassed by few distributors of Illinois, outside of Chicago.

B. F. Goodrich Rubber Co. has opened a branch distributing plant at Springfield, Ill. E. R. Cartwright has been appointed manager.

Fred O. Ramson, Jacksonville, Ill., has purchased the World Tire Store which was founded by William S. Dews. The former has a similar store at Beardstown, Ill., and will operate both.

Heckle & Kirtley, Bushnell, Ill., have leased the building occupied for several years by the Talbot Motor Co., and will occupy it on July 1, as a sales agency for motor cars, trucks and tractors and will also conduct a general garage business.

Aultman-Taylor Co., Decatur, Ill., distributors of tractors and agricultural implements, will move into a new building on Aug. 1. The building will be constructed with walls and floors of double strength in order to carry a large stock of tractors and other machinery. The company has the entire Illinois distribution, the eastern half of Missouri and two-thirds of the state of Wisconsin. The Decatur company has sixteen traveling representatives. Business has outgrown the old quarters, forcing the construction of new of much larger size.

J. E. Talbot, late Ford distributor at Bushnell, Ill., has moved to Macomb, Ill., and will be distributor of the Dodge Bros. car.

E. D. Olinger, Springfield, Ill., has opened a tire and accessory store.

Ernest Roberts, proprietor of a garage and accesory stire, at Carrollton, Ill., has filed a petition in bankruptcy. He scheduled liabilities of $6,771, and assets of $2,109.

Dependable Truck Service Co. has been organized at Springfield, Ill., and headquarters opened. Capital stock has been fixed at $15,000. The incorporators include L. C. Dodgson, Carl Brendel and F. A. Muench. The company will operate a truck line between Springfield and neighboring cities.

Pontiac, Ill., Valve Co. has been organized and headquarters opened. Capital stock has been fixed at $150,000. The incorporators include C. P. Clark, F. S. Shaw, and G. E. Walton. The company will manufacture valves for motor vehicles and other parts, accessories, etc.

George H. Wilmert, Lincoln, Ill., has opened a tire station and accessory store in that city. He has organized the Western Tire Repair Co. and has installed a complete line of machinery for rehabilitating tires.

George W. Jagers, Decatur, Ill., president of Comet Automobile Co., announces the early erection of a new unit, four stories in hight, 80 feet frontage and 400 feet in depth, to be utilized for the construction of car bodies, painting and trimming, and also the manufacture of sheet metal parts. Production at the Comet plant has reached five cars daily and it is hoped to increase this to ten cars daily by Aug. 1. Branches now being organized in South America are expected to send in much new business.

Christi Brothers, Clarence, Walter and James, have opened a garage and repair shop at Peoria, Ill. The plant will be utilized as a maintenance station for the Dodge Bros. car, and will also engage in the manufacture of a Ford lock of which the Christi Brothers are patentees. The shop will be equipped with first class machinery and will be ready to cater to heavy repairs of motor vehicles. The Christi Brothers were former residents of Peoria, but for the past ten years have conducted a garage in Chicago.

Longergan Automotive Radiator Co., Rock Island, Ill., expects to build a one-story factory 100x150 feet in that city, and will probably have work under way in 90 days. The radiator is constructed of horizontal units of copper. An initial daily production of 70 to 100 radiators is anticipated.

Snelling-Swint Tire Co. has recently been organized and incorporated in Atlanta, and is handling exclusively in the Atlanta territory the Firestone and Oldfield lines.

Briscoe Devices Co., Pontiac, Mich., maker of the Scoe carbureter, is conducting extensive cost study and cost-reducing experiments with a view to handling large volume business. The concern is now making Earl and Gray carbureters.

McMillian-Parker Auto Supply Co., Houston, is the name of a new automobile supply concern which has opened for business. Earl T. McMillian and A. D. Parker are the owners of the business. The new establishment will carry stocks of tires, tubes, Ford parts and accessories. A vulcanizing and repair department will be operated in connection with the sales end.

United Auto Service Corp., with capital stock of $10,000 has been incorporated. Its head offices will be in Springfield, Ill. Stock is held by E. P. Eustice and W. S. Wade, Des Moines, Ia., Bert E. Dodson, Iowa City, Ia.; W. T. Lord, Cedar Rapids, Ia.; P. E. Mullen, Moline, Ill., in equal proportions.

Campbell & Wochmer, Rock Island, Ill., rebuilders of automobile engines, certified to change of name to Nic LeGrand, Inc., with a capital stock of $35,000. Nick Le Grand succeeds Sam Campbell as president and Fred C. Lutz succeeds Ardo Gaetzig as secretary.

A. R. Mosler & Co., New York, which has been in the hands of receivers for a year and a half, has been taken over by a new organization. The plant at Mount Vernon will be operated hereafter as the Mosler Metal Products Corp. In addition to the line of spark plugs, which the company always has made, several automobile accessories will be added, as well as a full line of radio equipment.

Rowe Motor Mfg. Co., Lancaster, Pa., announces that it has decided to erect a new factory building, 327x120 feet, which will be devoted to the production of the Anderson truck tire. The Rowe company recently has taken over the Hydraulic Devices Corp. and the Anderson Tire Mfg. Co. Senator Owen of Oklahoma was one of the large stockholders in the tire company, which has a factory at Washington, D. C.

Measurite Co., Louisville, a $500,000 corporation, manufacturers of gasoline pumps, will erect a modern one-story steel and glass factory building on the Illinois Central and Kentucky & Indiana Terminal Railway Co. tracks at Fourteenth and Hill Streets, it was announced yesterday. The building will cost approximately $100,000.

Fisher Body Corp., Detroit, has taken over the former Cadillac plant where it will extend its present body manufacturing operations, and enter, for the first time on a large scale, the field of custom body work. Offices for the sale of the custom work will be opened in New York and Chicago. The plant contains 650,000 ft. of manufacturing space and will employ 2,000 men.

F. J. Wood Co., Hartford, Conn., has succeeded the Salisbury service station, the business being controlled by Fred J. Wood, formerly service manager of the City Auto Repair Co.

Commerce Trust Co., Kansas City, has asked receiver, election of new directors, and restraint on officers, of the Ferrell Motor Sales Co., for protection of interests of the bank to the extent of about $18,000, obligations of the sales company to the bank. It is alleged that Mrs. J. D. Marshall, formerly president of the sales company, transferred it and its assets to the Mexico Land company and officers thereof, to the bank's disadvantage; and that Mrs. Marshall is now president of the land company, while the former president of the latter is now president of the sales company.

Hathaway Motor Co., Kansas City, has leased a four-story building. The Hathaway company has distribution of Durant and Stutz passenger cars. C. E. Hathaway, a pioneer motor car distributor, is president.

Packard Motor Co., Kansas City, has leased the ground floor of the Overland building, McGee Trafficway front, and the front will be remodeled. The company moved to this building three years ago as a temporary location; but the district has so much improved, that the building is to be adapted to the purposes. The Overland company's entrance is on the Grand avenue side.

J. R. Watkins Co., Winona, Minn., automobile accessory distributors, with lines of spices also, has established a branch in Kansas City with T. R. Shaw in charge.

William R. Wilson, president of the Maxwell Motor Corp., Detroit, states that April net earnings of Maxwell consolidated, after interest and charges, is more than $500,000. He expects May to show a larger profit than April.

R. D. Britton Co., Hartford, Conn., Velie dealers, now have in course of construction a sales and maintenance building.

Sales Still Increasing In Southern California

In First Four Months of Year 21,000 New Cars Sold, as Compared With 13,000 Last Year

LOS ANGELES, June 5—The rush of automotive buying in Southern California continues. When it began in March there were many to predict it could not last long, but it is improving rather than diminishing. The splendid business is being enjoyed not only by the passenger car dealers but exclusive truck merchants are experiencing a big demand.

The truck business undoubtedly is based largely on the unprecedented building activity. Los Angeles has been ranking third among all the cities in the United States in building permits. There is not as much road building as in some previous years, but this line is constant, on the average. The number of Government and state trucks in use makes comparatively few privately owned trucks in this work.

Statistics just compiled indicate that the number of new passenger cars sold in this part of the state the first four months of the year was 21,651 as compared with 13,843 in the corresponding period in 1921. In Los Angeles city alone there have been 10,024 new cars sold in the four months as compared with 5,997 one year ago. Slightly more than one-third of all the new cars sold are Fords. Chevrolet is getting about 15 per cent of the total business. Willys Knight has shown a gain of 300 per cent. Six cars show fewer sales than last year. In some cases this can be attributed to the fact the factory's financial condition has hurt the confidence of the public in the car.

From the standpoint of sales the Studebaker, Dodge and Buick are trailing the Ford and Chevrolet in the order named. These five makes account for 15,349 out of the total sales of 21,651. Among the new makes the Durant is running away from the field. In the higher price classes the Cadillac has no competition, with an increase of more than 100 per cent. The new Maxwell, with its new representation shows one of the biggest gains with 709 sales as against 160 a year ago. Reo also shows a tremendous increase.

CONCERNING MEN YOU KNOW

Fred C. Rogers, for many years distributor of the White truck in Omaha, has returned from a winter trip to Florida. He announces that he has secured the agency for the Buda engine and Buda parts for Nebraska. The firm will operate under the name of the Motive Parts Co. of Nebraska.

William F. Hedges, who for the past three years has owned the Factory Delivery Station, Tire Co. at Fort Wayne, has assumed the position of manager of the Middle West States' branch of the Hydro-United Tire Co., in Chicago.

S. B. Mechtel, president of S. F. Bowser & Co., Inc., of Fort Wayne, has been re-elected president of the Indiana Y. M. C. A.

Walter S. Goll, who has been assistant general manager of the Fort Wayne, Ind., works of the General Electric Co., has been appointed manager to succeed F. S. Hunting, who has become president of the Robbins-Myers Co., at Springfield, Ohio. The local G. E. works has long been turning out a great amount of automotive equipment.

Bert Murphy, vice-president of the Andrew Murphy & Son, Omaha distributors of theDurant, has returned from the factory at Lansing.

S. deB. Keim, general sales manager of Rolls-Royce of America, Inc., Springfield, Mass., announces the appointment of Ralph B. Jackson, as western sales manager for Rolls-Royce, succeeding J. E. Roberts, resigned.

R. C. Newton, formerly connected with the No-Leak-O Co., Baltimore, is now connected with the Inland Products Co., representing them in Texas and Louisiana with headquarters in Dallas. A new office has been opened in Seattle in charge of **W. R. Thompson** and **C. C. Roe.**

John D. Evans, Hartford, Conn., formerly manager of the Hartford branch of the Packard Motor Car Co., of New York, has joined S. A. Miner, Inc., Pierce-Arrow distributors, and at a meeting of the board of directors was elected secretary.

J. G. Corey, Hartford, Conn., formerly associated with the Holcomb Auto Supply Co., has gone into business for himself, having opened a maintenance station.

Fred H. Miller, Hartford, Conn., has become general manager of Walter S. Halliwell, Inc., Mercer and Moon distributors. Miller was formerly district manager for Packard in New York, Brooklyn, White Plains and Poughkeepsie.

Warren S. Harris, Hartford, Conn., has been apponited general manager of the Hartford branch of the York Motors Corp., to succeed Hamilton W. Jones, resigned. York Motors handles the Lincoln in northern Connecticut.

Frank K. Barton has been appointed manager of the Newsum Auto Tire Vulcanizing Co., Little Rock, United States tire distributors, succeeding R. B. Babbitt.

J. H. Sommers, formerly southern district manager for the Packard Motor Car Co., has been named general manager of the Packard Enterprises of Georgia, distributors of the Packard in the Atlanta territory. The Atlanta company reports the sale of more than 25 of the new single six model recently announced by the Packard.

James M. Carples has become general manager of the Strut Rod Sales Co., with offices at New York City.

J. M. Howard, for more than six years advertising manager of the Chandler Motor Car Co., Cleveland, has resigned. Howard came here from Washington and formerly was a newspaper man in Virginia. His successor has been appointed.

Lee W. Bennett, has become manager of the wholesale department of Culton, Moylan & Reilly Auto Co., Chevrolet automobile distributors.

C. Paul Tracy, of the Gray Motor Co., Studebaker sales, has withdrawn from Tracy-Olson Co., Minneapolis. He is replaced by H. O. Hanch, a tire man. The firm is now Hanch-Olson Co., handling Kelly tires and the Exide battery.

Ray Battery Co., Ypsilanti, has re-elected Thomas H. Lavier, inventor of the Lavier formula plates used in its product, as president; **M. M.** Read of the Ypsilanti Savings Bank, vice-president; **J. S. McDowell,** secretary and **A. M. Colegrove,** treasurer. **E. B. Eastburn,** has been appointed salesmanager, having been formerly western district manager of the Republic Rubber Co., with headquarters at Kansas City. Additional finances have been brought into the company through the addition of the new officers and the production facilities of the plant will be increased to meet new business demands.

J. A. Grier has been made western district manager of the Cadillac Motor Car Co., Detroit, and has been succeeded as specification manager in the sales department at the factory by Chester B. Hill.

A. K. Steigerwalt has been appointed manager of the new parts and service division of the Lansing plant of the Durant Motor Co. Steigerwalt had been connected with the Chevrolet organization since 1909, first serving with the Chevrolet Motor Co. of New York, then at the factory at Flint and recently at the Chevrolet headquarters in the General Motors Building, Detroit.

David R. Wilson, general manager of the Wilson Foundry and Machine Co. plant at Pontiac, has been spending a week in Toledo.

J. E. Neale has been appointed salesmanager of the Spencer-Smith Machine Co., Howell, Mich., manufacturer of the Spencer-Smith piston. Neale succeeds A. W. Lines who resigned, effective June 1. In connection with the appointment the company declares its future sales policy will be directed to more intensive covering of each territory.

16 Cars Compete in Annual Camp Curry Economy Run

Los Angeles, June 3—This year's economy run from Los Angeles to Camp Curry, Yosemite Valley, the sixth annual event, was participated in by 16 cars, divided into five classes according to the factory list price. The decisions are based on the ton miles, and in the sweepstakes gasoline, oil and water consumption receive consideration.

In Class 1-E the Chevrolet won without opposition, with an average of 41.85 ton miles per gallon of gasoline. In Class 2-E Earl, by averaging 51.3, defeated the Dort, Gardner and Maxwell. The Templar defeated the Ace in Class 3-E with an average of 46.28. The Oakland, Stephens, Kissel, Reo, Liberty and Jewett competed in Class 4-E, and the Oakland won with 49.37. The Dorris trimmed the Duesenberg and Marmon in Class 5-E by averaging 48.5. By not showing any oil consumption and only 2 pints of water, the Oakland defeated the Earl, its nearest competitor, in the sweepstakes by 49.20, as against 49.05.

The distance was 360 miles. The records of road miles per gallon of gas alone were: Chevrolet 30, Earl 30, Dort 28.8, Gardner 27.17, Maxwell 23.98, Templar 25.71, Ace 21.02, Oakland 29.38, Stephens 26.67, Kissel 20.86, Reo 20.13, Liberty 20.28, Jewett 20.48, Dorris 17.66, Duesenberg 21.02, Marmon 14.12.

Ton mile in this contest means the mileage obtained from one gallon of gasoline multiplied by the number of tons the car weighs. Thus a car weighing two tons and having a road mileage of 30 miles to the gallon would have a score of 60 ton miles to the gallon.

WHEEL FACTORY ENLARGES

Lansing, Mich., June 2—The Motor Wheel Corp. has let a contract for the construction of two additional units. The addition to the Prudden plant will be approximately 120 x 400 ft. and the addition to the Gier plant will be approximately 130 x 225 ft.

Book Will List Standards for Automotive Equipment

Purpose Is to Bring About Uniform Practices and Eliminate Unnecessary Sizes

CHICAGO, May 31—The standardization handbook which the Standardization Committee of the Automotive Equipment Assn. is publishing will be ready for distribution in advance of the convention of the association which meets at Colorado Springs June 19, according to Charles P. Hughes, secretary of the committee. This book is the result of several years work by members of the committee in an effort to develop standard practices in the manufacture, shipping and selling of automobile accessories.

The book will be in three sections, the first of which will be devoted to general information about the Automotive Equipment Assn. This will include the constitution and by-laws, personnel of the board of directors and the various committees, functions of the committees, the 31 fair trade practices of the association, the roster of membership, and an explanation of the credit and collection departments of the association.

The second section will be devoted to standard and recommended commercial practices, with reference to such matters as unit packages, inner packages, shipping cases, better packing in order to increase the merchandising possibilities of accessories, more complete marking of unit packages, inner cartons for reshipping purposes and shipping cases so that the stock clerk will not have to open a box on receipt to know what it contains.

This marking will include order number, the case contents and such other information as should be shown. This section will also include pages showing a standardized expense report and cost accounting system for jobbers.

In the third section will be reprinted certain pages containing standard and recommended practices of the Society of Automotive Engineers. These pages are reprinted by permission of the S. A. E. This section gives, among other information, the proper nomenclature of all parts of the automobile.

One of the objects the Standardization Committee hopes to accomplish is the elimination of obsolete and unnecessary sizes and styles in automobile parts, equipment and accessories, as well as of the containers in which they are packed. This is expected to be of direct benefit to dealers, reducing the number of sizes and styles they will have to carry in stock and facilitating the handling of their stocks.

The book is to be bound in loose leaf style, making it possible to print and insert new pages as other standards are agreed upon and adopted.

The READERS' CLEARING HOUSE

Questions & Answers on Dealers' Problems

Labor Lien Has Priority Over Mortgage in This Case

Q—On December 15, 1921 we agreed to repair a Buick car at our garage. We did this repair work and the bill, both labor and parts, amounted to about $40. The owner did not have the money with which to pay us so he agreed with us to pay storage since the car was finished, if we would give him time. Now comes a third party claiming to have a mortgage on said car, and claiming that he can take the car from us without paying either our labor or parts bill.

We find that he has the mortgage all right but his mortgage was made March 1st, 1921 and never recorded until March 24th, 1922, over three months after we took the Buick in for repairs. Under the Oklahoma laws can he make us give up the car? Then again, assuming that he had recorded his mortgage promptly and before we repaired the car could he in that event have taken it and deprived us of our recompense for labor or repair parts, or both, as well as the storage bill, bearing in mind that we now have possession of this car.—A Reader.

You have a lien on the car for both repairs and storage. The law gives you this lien and a further agreement to pay storage while you retained possession until your charges were paid is unnecessary to collect for storage, providing, of course, you were holding the car for payment of your bill.

An unrecorded mortgage is good between the parties to the mortgage, but is not a valid mortgage as against the rights of third parties without notice or knowledge of its existence. The statute makes recording of certain instruments notice to all the world, but only from the date of recording the said instruments. Hence your lien is superior to that of the mortgage holder on the facts as you set them out, and he cannot make you give up the car without paying your bill.

Now had he recorded his mortgage before you repaired the car, his mortgage would come before your claim for repairs. Even under his mortgage where it had priority he, the mortgage holder, would be required to foreclose the mortgage and sell the car, and you would have a right to have your claim satisfied out of any money left over after the mortgage holder had been satisfied. In such cases as this, which are common by the way, it is to the interest of all lien holders on personal property to see that same has been properly advertised and sold to the highest bidder possible.

The Readers' Clearing House

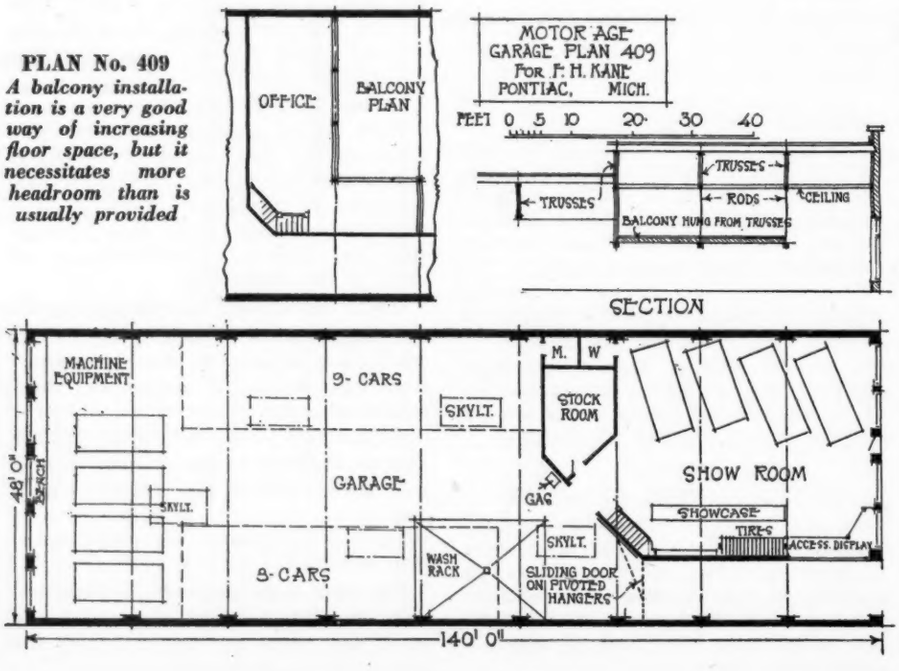
THIS department is conducted to assist dealers and maintenance station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Addresses of business firms will not be published in this department but will be supplied by letter.

Technical questions answered by B. M. Ikert, P. L. Dumas and A. H. Packer; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; Tires, by a Practical Tire Man; General Business questions, by MOTOR AGE organization in conference.



PLAN No. 409
A balcony installation is a very good way of increasing floor space, but it necessitates more headroom than is usually provided

Cost of Buildings Varies by Conditions

PLAN NO. 409

Q—The writer is interested in obtaining plans and estimates on a one-story salesroom and garage to be built on an inside lot, 48 ft. frontage and 200 ft. deep. The structure which I have in mind should have a salesroom large enough to display four cars in, and, perhaps, a balcony containing office space. The garage should be large enough to store 25 or 30 cars with provision for wash racks, filling station (inside garage) and some bench space. I was thinking of running the building back only 140 ft. at present and adding to it later to the depth of 200 ft. as the demand developed.

Any information you may be able to give me will be thoroughly appreciated.—F. H. Kane, Pontiac, Mich.

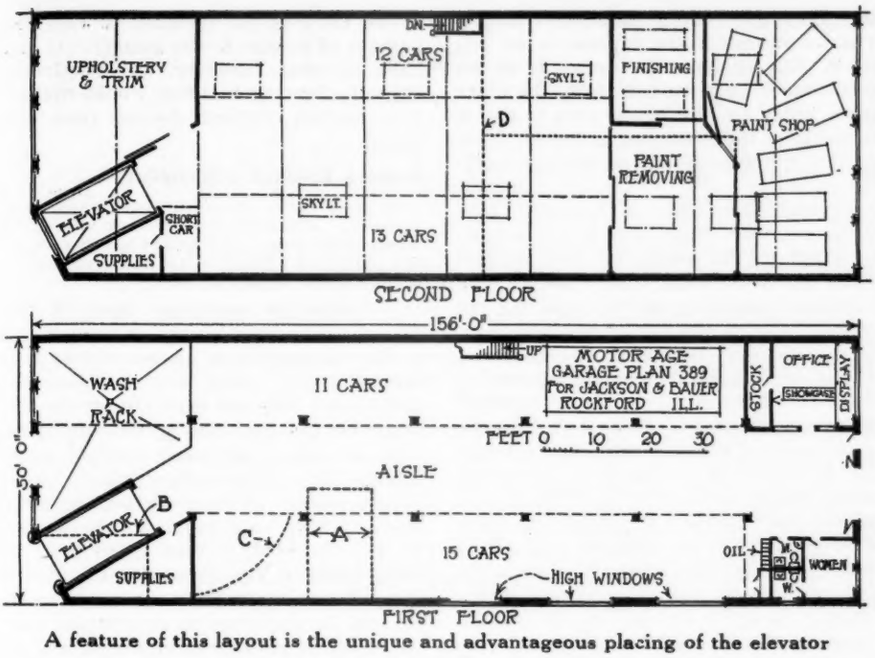
This layout should make a fairly good salesroom and garage. The garage has not quite the capacity you hoped it would have but when there are no cars in the shop it can be used for storage, increasing the total by 3 to 6 cars.

The three front trusses are 5 ft. higher than the rest to give sufficient headroom for the balcony. They may be made heavier in construction also in order to carry the weight of the balcony and its contents, thus avoiding posts on the main floor.

The only way to get a line on cost is to get a contractor to figure the job and to get anything but an approximate figure you must have very complete and detailed specifications. Even then two or three contractors will give you widely varying bids. We could make a wild estimate that with a heating plant, and all finished complete this building would cost $35,000 but that is based on costs here and you might do much better.

It is doubtful if cost data on the buildings referred to in your last letter would give you any idea since building conditions are better now than when they were built. It would do no harm to inquire, however, and letters to these concerns would doubtless bring replies and could be taken for what they are worth.

It would hardly be advisable to divide off the shop by a partition in this case as you will, no doubt, add the remaining 60 ft. in the near future and fit a good share of the addition up for shop purposes.



A feature of this layout is the unique and advantageous placing of the elevator

Paint Department Can Be Enlarged as Business Grows

PLAN NO. 389

Q—We would be pleased to get a sketch, outlining a two-story building on a lot 50 x 156 ft. as per plot enclosed. This building is to be used as a storage and cleaning service garage on the first floor and the second floor to be used for painting and refinishing room.

The idea we have in mind is to put a building on this lot which will give us a maximum income per square foot and we feel that with the increasing number of automobile owners, a high grade storage garage would pay in this location.

Any data that you may have regarding this kind of a proposition will be very much appreciated by us.—Jackson & Bauer, Rockford, Ill.

Unless you expect to do an exceptionally large painting and retrimming business, we would think that you would need to use part of your second floor for storage, in order to get the best returns on your money.

With that end in view we have made our layout so that the shops and elevator take about half of the total floor space, leaving the other half open with a capacity of 25 cars.

You will note that the elevator is placed at a very unusual angle. This is because of the width of the building. If the building were 5 or 6 ft. wider, it might be placed crosswise as at A, but here there is not sufficient turning space in front of the elevator to make a crosswise location practical.

It could be placed at B but here about 3 car spaces must be sacrificed to give an approach, C. By placing the elevator at an angle, a better approach is had to and from the aisle and from the alley, so from all standpoints the angular placement is superior to any other.

If a larger paint shop should be desired, it could be extended to D or further to give the desired capacity. It would be better not to make it too large as the space could not be used for storage very well, while in the rush painting season the garage space could be used, just as well as any other, for applying rough stuff and rubbing.

The finishing room should have extra light and be sealed up with dressed lumber, beaver board or otherwise made dust-proof.

Architectural Service

IN giving architectural advice, MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, maintenance stations, garages, dealers' establishments, shops, filling stations, and, in fact, any building necessary to automotive activity.

When making request for assistance, please see that we have all the data necessary to an intelligent handling of the job. Among other things, we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

CONVERTING CLOCKWISE TO ANTI-CLOCKWISE MAGNETO

Q—We have a Dixie magneto that turns clockwise. Is there any way to make it operate properly when turned anti-clockwise? We would like this information as we have a model 35 Studebaker on which we wish to install the magneto. —Henderson Motor Co., Judsonia, Ark.

1—The rotation of the Dixie magneto can be reversed by getting a new cam from the nearest Splitdorf maintenance station which, we believe, is in Little Rock. It is also advisable to check the gap between the edge of the inductor and the pole piece at the instant that the interrupter points just begin to open as this gap should be .040 inches. It is also necessary to reset the distributer gear so that with the interrupter points just ready to open, with the interrupter in the advanced position (rocked against rotation), that the distributer brush will just be coming on a segment and just making full contact with the segment but it should not have moved any appreciable distance across the segment. Additional information will be sent you under separate cover giving a more complete description of the process we have briefly described. This pamphlet will come direct to you from the Splitdorf Magneto Co., Chicago.

CYLINDER HEAD CAP FOR TWO PLUGS

Q—Advise where we can secure a cylinder head cap for two spark plugs for a Hudson Super-Six.—Merville Motor Car Co., Binghamton, N. Y.

We have been advised by the local Hudson distributors that information regarding the purchase of the two spark cylinder head for the Hudson may be secured from Davis Lewis, Service Manager, Hudson Motor Car Co., Detroit, Mich. The Hudson company does not regularly manufacture the head for two plugs but it may be possible that they can furnish them. With the exception of this information we know of no other organization that makes or sells cylinder heads for Hudson Super-Six that will accommodate two spark plugs.

MAINTENANCE QUERIES

Q—Give us names of some firms that sell fillers for scored cylinders.

1—This information will be given by letter.

2—Will a hard solder that melts at 475 degs. F. melt out of the cylinder?

2—We do not believe the temperature in a water cooled engine will be high enough to melt solder which melts at 475 deg. F. However, we have some doubt as to whether it will continue to adhere to the sides of the cylinder, as in many cases material of this kind chips off after a short period of use.

3—Would it materially weaken the knuckle in a model V Grant to slit it and install a clamping bolt so as to clamp it to the king bolt?

3—The information you have given us is not sufficient to give an idea of the reason for these changes you wish to make in the steering knuckle. Under ordinary circumstances parts for various cars are properly designed and if defective or worn, new parts should be employed. If the clamping scheme is designed to take up wear or looseness, we think it would be advisable to use a new part instead as the parts used in the steering mechanism are very vital and under ordinary circumstances should not be tampered with in any way that would tend to weaken them. We will be glad, however, to give this additional attention in case you wish to submit complete information as to the proposed change.

4—What speed will a Franklin series 9 make?—W. F. Bailey, Decatur, Ill.

4—The Franklin series 9 is capable of approximately 50 m.p.h.

Miscellaneous Electrical Information

Q—Will changing the gap in a spark plug have anything to do with the sparking at the interrupter points. If so explain why.

1—In the operation of an ignition coil the demagnetizing action takes place very rapidly until the spark jumps at the spark plug, and this flow of current in the secondary windings produces a reverse magnetic effect which slows down the dying magnetism. For this reason the voltage in both the primary and secondary windings rises very rapidly until the spark occurs, so that the smaller the spark gap the quicker the discharge will take place and the less voltage will be produced in either winding. For this reason, if the spark plug gaps are set very wide the voltage will rise very high in both windings, and in the primary winding this voltage strains the insulation of the condensor and tends to produce bad sparking at the interrupter contacts.

Capacity of Condensor

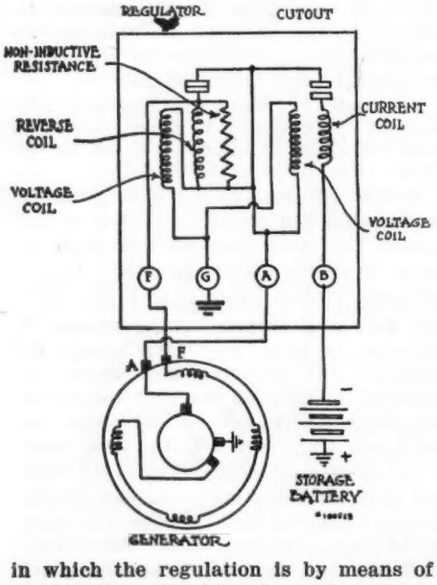
2—What is the capacity of the average condensor used in ignition coils?

2—Average ignition condensors will have a capacity from .25 to .35 microfarads. Exceptions to this are the condensor used in Ford vibrating coil, which is approximately .5 M. F., and the condensor used in Atwater-Kent type C.C. is smaller, being approximately .12 M.F.

Vibrating and Third Brush Regulating

3—Explain fully the vibrating and third brush regulation as used on Pierce-Arrow, Delco generators. Give diagram of regulator and connection.

3—A portion of the wiring of a Pierce-Arrow car showing the battery, generator and regulator is given below,



in which the regulation is by means of combination third-brush and voltage regulator. The reason for this combination is to get the advantages of both systems, the third brush regulation having the ability to hold down the current at high speed, while the vibrating type voltage regulator sends less current to the battery as it becomes charged. The operation of the system is as follows: One of the main brushes is shown as grounded, and current from the other main brush or live brush goes to the A terminal of the generator and from there to the A terminal of the cut-out regulator.

Current from the A terminal goes through both voltage coils to the ground terminal of the regulator, and current from the A terminal also goes up to a common connection on the upper cut-out contact, also to the upper regulator contact. As the regulator contacts are normally closed, this gives a connection from the A terminal to the F terminal so that current will flow back into the F terminal of the generator and through all of the field windings to the third brush, which completes the field circuit. When the generator voltage is high enough the cut-out contacts will close, connecting the A terminal through the current coil to the B terminal, which allows charging current to go to the battery, the current coil helping the voltage coil to keep the contacts closed as long as the current is charging the battery and operates to oppose the action of the voltage coil as soon as the battery begins to discharge. When the voltage of the battery rises the current to the voltage coils also increases, and on the regulator side of the control apparatus it causes the regulating contacts to separate.

The field current must now go from the A terminal through both the resistance and the reverse coil in order to get to the field windings, the non-inductive winding being put in to reduce arcing at the regulating point. The action of the reverse coil is doubtless to neutralize to some extent the effect of the voltage coil and cause the regulating contacts to quickly close again, so that their vibrating action is very rapid and produces even voltage regulation instead of uneven and jerky regulation of voltage. Setting of the third brush and regulator would no doubt be best accomplished by first holding the regulating contacts closed so that they cannot operate and adjusting the third brush to give the maximum current desired, which might be 15 or 18 amperes to a charged battery. The regulating contacts should then be released and adjusted to give the current desired this, varying with the condition of charge of the battery, being 15 or 18 amperes to a discharged battery.

Vibrating Type Rectifier

4—Is it possible to adjust the charging rate on a vibrating type rectifier for battery charging?

4—On vibrating type rectifier used for charging batteries the vibration is used for the purpose of connecting and disconnecting the circuit so that only those current impulses which are in such a direction as to charge the battery will be used. Adjustment of the vibrator, as far as we are aware, is usually for the purpose of getting the contact to make and break at exactly the right instant to accomplish the above results, and as far as we know is not intended to vary the amount of charge to the battery. If you have in mind, however, any particular type of vibrating rectifier, would suggest your getting explicit details from the maker.

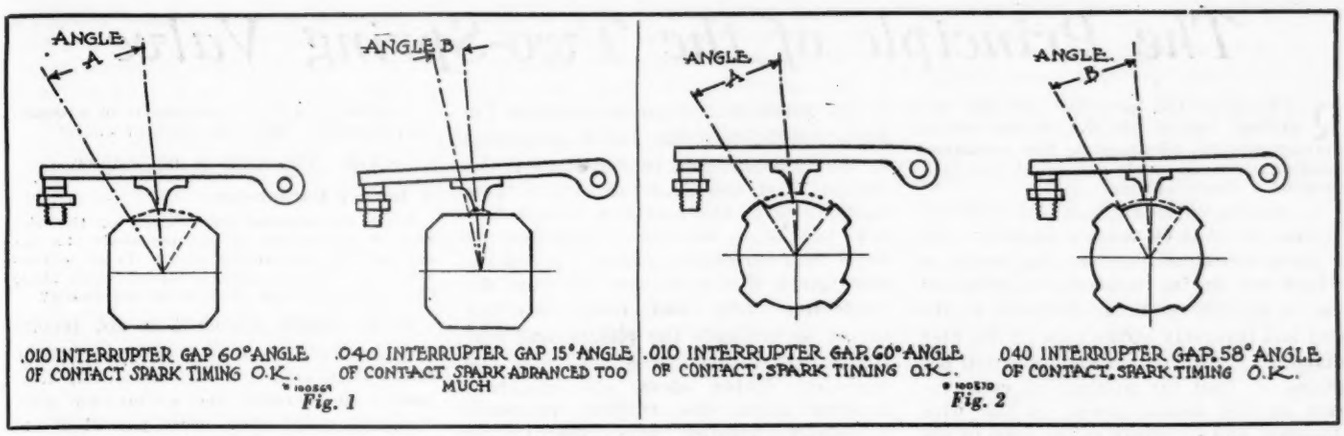
Ignition Breaker Adjustment

5—Why are different make ignition breakers adjusted to different distances when fully separated and what would be the result of adjusting to wider or smaller gap than recommended?

5—Ordinarily speaking, there is no reason for specifying any particular gap at the interrupter of an ignition system except if the points are too close together they may not separate far enough to break the arc, and if too far apart may not return and make contact quick enough for good operation at high speed. This summary of the conditions is, however, affected very much by the design of the cam that is used. The type of cam shown in Fig. 1, causing the operation of the ignition to be very much affected by variation in interrupter gap, while the came shown in Fig. 2 has no vital bearing on the interrupter gap setting. Two illustrations are shown, the one at the left showing an interrupter in which we will assume that the setting is correct, being .010 in., and with this setting the fibre in the center of the interrupter lever will not drop down very far when the interrupter points close, so that we will assume that the cam turns through an angle of 60 degs. while the points are in contact. This angle of rotation while the points are in contact will allow current to flow to the ignition coil long enough to allow it to become fully magnetized, so that the spark will be of full strength. The time at which the spark occurs is the instant at which the interrupter points open, and in this case it will be angle "A" from the position shown in the left-hand sketch, which we will say is the correct timing for the engine.

Now let us assume that some electrician not familiar with the exact setting of the interrupter points should set them to a wider gap, which we will say is .040 in. When the interrupter points close, this will allow the fibre bumper in the middle of the interrupter arm to drop down much farther, so that the angle of contact will be very much reduced, and we will say it is now 15 degs. instead of 60 degs.

This means that the coil will have only one-fourth of the time required for it to become fully magnetized at high speed, so that the spark will be accordingly very weak and the engine may miss at 25 m.p.h., this being, of course, an exaggerated case. It will be also noticed that the cam must now turn through only the angle "B," which is much smaller than "A," so that the spark will occur much sooner or it will be much advanced from the correct timing. The man who tries to start this engine will now find that it either kicks back and that he is in danger of being injured, or if using the starter it may kick back and break the starter. We will


ANGLE A
ANGLE B
.010 INTERRUPTER GAP 60° ANGLE OF CONTACT SPARK TIMING O.K.
.040 INTERRUPTER GAP 15° ANGLE OF CONTACT SPARK ADVANCED TOO MUCH
ANGLE A
ANGLE B
.010 INTERRUPTER GAP 60° ANGLE OF CONTACT, SPARK TIMING O.K.
040 INTERRUPTER GAP 58° ANGLE OF CONTACT, SPARK TIMING O.K.
Fig. 1 Fig. 2

now take up the type of cam shown in Fig. 2, where as before the sketch at the left shows the interrupter properly set to .010 in. and the angle of contact 60 degs., the spark being properly timed. As before, we will assume that at the right the interrupter contacts have been set to .040 and that the fibre bumper in the middle of the interrupter arm drops down accordingly.

Due to the shape of the cam, however, the angle of contact has been changed but slightly, being now 58 degs. instead of 60, and this angle of contact will have so little effect on the time that the coil has to build up that it will never be noticed. It will also be seen that the angle "B" is very nearly the same as the angle "A," so that the engine will still be properly timed. If we should go back to Fig. 1 and consider that possibly the sketch at the right showed the correct condition, then if too small a gap at the interrupter contact should be used, as indicated at the Fig. at the left, the result would be to unnecessarily waste battery current and to have the ignition timed too late instead of too early.

Finding Internal Short

6—How can you determine if there is an internal short in one or more cells of a storage battery without tearing it apart?

6—An internal short in a battery can be determined by connecting it to a high rate discharge tester such as a carbon plate rheostat which has a high reading ammeter in series with it and allowing it to send a heavy current to the rheostat. The covers should be removed from the cells, and on looking in, a cell which is shorted will show a bubbling and boiling action which is not noticeable in other cells. If at the same time voltage is taken across the different cells, those which are normal will show perhaps 1.8 to 2 volts, while the shorted cell will show either a very low reading or perhaps a reading in the wrong direction.

Condensor for Test Outfit

7—Can you advise where we can obtain a reasonably priced condensor suitable for use in construction of a test outfit for ignition apparatus?—A. Reader, Sacramento, Cal.

7—Most any ignition condenser sold for use on 6-volt system will be suitable for your ignition tester, or one can be obtained from an old Ford coil.

IGNITION ON STANDARD 8

Q—Give information on the ignition system of Standard 8, model 1920.

1—The ignition system on the model 1920 Standard 8 includes a Dixie magneto and an Atwater-Kent battery ignition system, each one being independent of the other. A novel feature of the Dixie system is that a wire from the starting motor connects to the magneto so that automatically when the starting switch is operated battery current flows to the magneto, which makes it produce a very hot spark at speed at which the starting motor cranks the engine. The other wire shown going to the magneto interrupter is the wire which is grounded for stopping the mag.

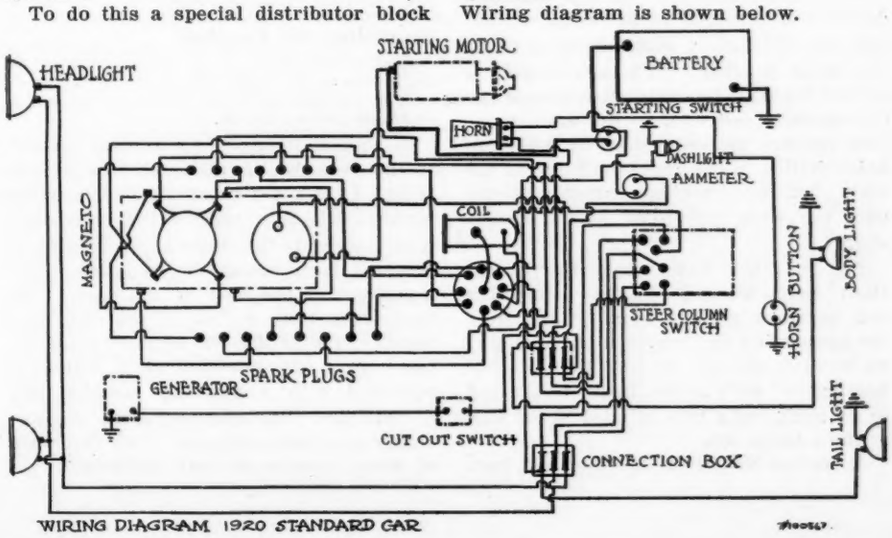
2—How may the spark be tested out and properly synchronized?—Roy F. Brown, Fort Oglethorpe, Ga.

2—The quality of spark can best be tested by having one or more of the high tension wires loose on their spark plugs so that with the engine running one wire at a time can be removed from the spark plug and held within 3/16 in. of the engine, so as to form a spark gap. Then with the engine running slowly the spark should jump at this gap without missing, which shows that the ignition system is in good shape. Any failure of a cylinder to fire would then be in all probability due to a fouled spark plug. Synchronizing the spark is a very difficult process on the car without special equipment, although it is possible to do so on a car equipped with two ignition systems.

To do this a special distributor block would have to be made for the magneto so as to permit sparks from the distributor brush to jump to a grounded brass ring graduated in degrees. With the engine running on the battery system, the sparks produced by the magneto could be observed as they jump to the graduated brass ring, and any variation in angle between the sparks should then be noted, this being caused by slight variation in the machining of the cam. A similar scheme could be used by running on the magneto and making up a graduated brass ring to which sparks from the battery ignition distributor could jump. In this case, however, it might work out better to have the brass ring insulated and connected to the high tension terminal of the coil while the distributor brush or the distributor arm or rotar would be temporarily grounded for the purpose of this test.

Synchronizing the sparks, or rather checking up the condition, to see that they are synchronized is more of a laboratory process and usually not required in checking ignition trouble on a car, as variation in timing can hardly be caused by anything except a change in the shape of the cam, which is not likely to be inaccurate. With ignition systems, however, which have automatic advance or some backlash in the distributor shaft it is, of course, possible that the amount of backlash will vary slightly between sparks, causing a slight variation in the timing of the different cylinders.

Wiring diagram is shown below.



WIRING DIAGRAM 1920 STANDARD CAR

The Principle of the Two-Spring Valve

Q—Explain the principle of the two spring valve. Is the outer spring strong enough alone or is the combined tension of both made to equal the tension of a single spring?

1—Double valve springs are used for various reasons on certain engines. For a given maximum pressure the stress to which the spring material is subjected varies directly with the diameter of the coil and inversely as the cube of the wire diameter. Also for certain deflection per pound of load the number of coils varies as the fourth power of the wire diameter and inversely as the cube of the coil diameter.

Therefore increasing the coil diameter increases the stress and decreases the number of coils required while increasing the wire diameter decreases the stress and increases the number of coils required. To secure the compromise between these two conditions on high speed high efficiency engines which run at a temperature generally above the temperature of the stock engine two springs are often used. First to enable a smaller gage wire and smaller diameter coil to be utilized, and second to provide against dropping the valve into the cylinder in case of a spring breakage and to enable operation of the valve in case one of the springs should break. There is also a certain amount of advantage secured by using two springs in that they tend to prevent the effect of a floating valve at high speed.

Dry Sump Oiling System on Racing Cars

2—Explain the dry sump oiling system as used on some racing cars in last Indianapolis or any other race. Publish illustration of complete oiling system including the hand feed by the mechanician.

2—An illustration of a typical dry sump oiling system will be mailed to you. The action of the dry sump pressure oiling system is as follows: Oil is usually contained in an outside vessel such as a tank mounted some place on the chassis, this is connected to the intake side of the gear or plunger type force pump.

The pump draws oil from this tank and delivers it through ducts in the crankcase or through a distributing pipe to the main bearings. The crankshaft is drilled through its entire length and the oil which is delivered to the main bearings reaches the crankshaft by means of holes drilled in the crankshaft and in the main bearing bushings which register once per each revolution of the crankshaft.

The oil that flows from the crankshaft main bearings to the connecting rod bearings and in some cases from the connecting rod bearings is conducted up to wrist pins by use of a tubular connecting rod with a tube inside of the rod or by means of a tube clipped to the side of the I-beam rod.

A portion of the oil is taken off from a T or other similar connection from the main distribution pipe and is conducted to the camshaft and rocker shaft if the engine is of the over-head valve type. In some cases the rocker arms are hollow and these also are lubricated by force feed through the hollow camshaft. The splash that is thrown off from the connecting rods and main bearings serves to lubricate the pistons and cylinders while the excess oil from the camshaft drains along the camshaft housing down the vertical camshaft driveshaft housing over the timing gears and back through a duct or pipe to the intake side of the pump or to the tank.

The hand feed is not always used on the full force feed system but where it is used it is merely as a substitute for the regular force feed pump driven by the engine. The outlet or discharge side of the hand pump is usually connected to the main oil distribution pipe and is protected from back pressure from the power driven pump by means of a check valve inserted in the line.

Changing Essex Rear Axle Gear Ratio

3—Can a rear axle ratio of 3.5 to 3.7 to 1 be installed in an Essex axle housing?

3—A gear ratio equipment to be used for high speed work which is furnished by the Hudson-Essex Co., is 4 4/15 to 1. It is possible to install a gear ratio of approximately 3⅞ to 1 in this housing. Except for very special work on straightaways and with a flying start the high ratio is not advised.

Enlarging Essex Valves

4—Can the Essex valves be increased in size? If so, how much?

4—The Essex valves can be enlarged but it is not advised because it is not practical. This has never been done on any of the Essex racing cars.

Increasing Valve Lift

5—Can the lift of both Essex valves be increased? If so, how much?

5—The lift of the valves can be increased approximately 1/16 in. by grinding the heel from the cam.

Regrinding the Camshaft

6—Explain how a camshaft is ground to increase the lift. How much is generally ground off? Give names of firms engaged in this work.

6—Camshafts are very seldom ground to increase the lift although this is possible. It is not a recommended practice because where a greater lift is desired it is preferable to secure a new camshaft. The lift is increased by grinding away a portion of the heel of the cam. The heel being that portion of the cam diametrically opposite the highest point on the cam. Any machine shop which is equipped with a grinding machine can do this job. The manufacturers of camshafts are best equipped to do this sort of work because of their equipment.

7—Can the Essex camshaft be ground? The Dodge? What is limit of each?

7—Yes. The limit is not known.

A Larger Carbureter

8—If the intake valve area of the Essex is increased is it necessary to increase the carburetor size? Is it worthwhile to increase the carburetor size since the manifold size cannot be increased?

8—As before stated it is not recommended that the valve area be increased, but if increased it is not absolutely necessary to increase the carbureter size. A larger carbureter would permit of securing a greater amount of gasoline to the engine at high speeds. We know of a certain firm who is building an Essex racing car who intend to install a Hudson carbureter. The effect of increasing the valve size and allowing the carbureter size to remain unchanged gives the effect of securing higher velocity to the gas. If the higher velocity is present it does not harm except that the passages should be free from obstructions in order to secure the maximum efficiency.

Changing Position of Gas Tank

9—On a Dodge speedster or sport car, what disposition can be made of the rear springs and gas tank. They do not lend themselves to sport lines.—E. Johnson, Kansas City, Mo.

9—It might be possible to construct special fenders which would completely conceal the rear springs and the body could be so constructed that the tank would be a continuation of the lines of the rear of the body. At a later date we will publish a few suggestions on converting an Essex stock car into a raceabout.

Cause of Bendix Drive Sticking

Q—What is generally the cause of the Bendix drive sticking and refusing to crank the car?

1—The operation of a starting motor with Bendix drive depends on the inertia of the pinion which causes it to stand still for an instant after the starting motor begins to revolve. This causes the pinion to slide along the shaft and go into mesh with the flywheel. When the engine starts the sudden increase in speed of the flywheel has the reverse effect on the pinion and suddenly shoots it out of mesh causing it to spin back along the starter shaft and in some cases to come up against the stop with considerable force.

It sometimes happens that the pinion will tend to jam or stick at the end of its travel when it has been suddenly thrown out of mesh with the flywheel so that the next time the starting motor is operated the pinion will merely sick to the shaft and refuse to slide along and go in mesh wih the flywheel.

On starting motors where the pinion is exposed and is out in the air and is subject to accumulation of dust and dirt such a condition may aggravate this tendency and produce the sticking complained of. Washing thoroughly with gasoline and allowing shaft and pinion to become thoroughly dry will probably correct the condition under these circumstances.

On starting motors like the Ford installation where the pinion runs in the oil bath and is inside of the flywheel housing the trouble is probably due to some slight bur or minute piece of metal in the corner of the end of the thread which causes the pinion to stick. Conditions of this kind are noted by the starting motor spinning very rapidly when the starting pedal is operated but with no apparent tendency to crank the engine.

A broken Bendix spring will also give this system rapid rotation of the starting motor with no other action. There is another case in which the Bendix may stick and that is when the teeth of the flywheel are not beveled just right and there is blunt place left into which the corner of the tooth of the Bendix pinion may happen to strike.

In this event the starter will not work and it will also be impossible to crank the engine. The remedy is to put the gearshift in the high position and rock the car forward and backward until pinion is jarred loosed. This latter trouble is, of course, of very rare occurrence.

Voltage of Cell Reading Above Normal

2—What is the cause of the voltage of a cell reading considerably above normal. We had one that registered 2.9 volts in one cell.

2—You do not say under what conditions the voltage of the cell was measured when it was found to be 2.9 but we assume that this was when the engine was running and the generator charging the battery, as we know of no condition which would give this reading otherwise. This is most likely due to terminals being poorly burnt to the connecting strap which causes a high resistance and when current is forced through this high resistance it shows up as a high voltage at the cell. Aside from high resistance due to a poor lead burning job the condition might be due to the cell being dry there being practically no water in it or to the use of very poor separators which have a high resistance and produce the same general affect as the poorly burnt connections.

Testing Cut-Out When It is Off of the Generator

3—What is the best way to test a generator cut-out off the car if you have no generator or test bench?

3—The best way to test a cutout when off of the generator and when no test bench is available is to use a 12-volt battery or two 6 volt batteries connected together plus terminal of one to the minus terminal of the other. Wires should be put on the cutout connected to the terminal which is ordinarily hooked up to the generator and also to the common terminal or ground. These wires should be connected across 6 volts, that is, 3 cells of this battery combination and a faint spark should be observed as these wires are flashed on and off the terminal but the cutout points should not close although there should be some tendency for them to do so.

The wires should now be connected across 8 volts that is 4 cells of the battery combination and the cutout points should close. This will show that the cutout is set neither too stiff or with too limber a spring and shows that it will cut in with about 8 volts which will give a small charge to the battery and indicates that it will cutout at about 6 volts and will not pull a heavy discharge from the battery.

Making a Resistance Test Set

4—We have a Weston test set for testing generator and starting motor armatures. Explain how we can make a resistance to use in connection with a six or 12 volt battery to allow a small amount of current to flow through the winding of the armature so that we can use the .1 volt scale. We have been using dry cells but they cost too much.—Warren L. Deppeler, Portland, Ore.

4—In using either a 6 or 12 volt battery for this test would suggest that you use one cell only which will give you two volts or the equivalent of about 2 dry cells in series and if you do a great deal of testing it will be possible to use first one cell and then another cell of the battery so that the discharge current will be distributed and will prevent one cell only becoming badly discharged.

If this gives too much current to the armature and causes the milli-voltmeter to go off the scale you can make a rheostat by driving some shingle nails in a soft wood board and taking a roll of stove pipe wire and stringing it back and forth on the shingle nails in a sort of a zigzag fashion, so that you get a lot of iron wire in a short space.

This improvised resistance can then be connected in series with one cell from the battery also in series with the armature and by experimenting you can find the right amount of iron to use to give you the correct reading on the milli-voltmeter. After this iron wire rack is made you can also connect in to more or less of it to get the desired result.

Using Car Generator for Shop Battery Charging

Q—We have a Gray & Davis generator which was at one time used on a Ford car and contemplate driving this with a small engine for the purpose of charging storage batteries. Will it be possible to use it in this way?

1—The Gray & Davis generator being a six volt machine it is not capable of charging a 12 volt battery, as the generator will overheat. It is capable, however, of charging one battery at a 10 or 12 ampere rate or two batteries at 5 or 6 ampere rate each.

Charging Rate

2—If we do use the generator for this purpose how many amperes is it possible to use to charge a battery?

2—The permissible charging rate to the battery varies when the battery begins to gas too freely or when its temperature rises above 100 degrees fahrenheit. From the generator standpoint, however, the charging rate will probably be limited to about 12 amperes.

Two Batteries on Line at Once

3—If we had two batteries on a line at once and generator produced 10 amperes, would the current be divided equally to each battery, for example, 5 amperes to each?—J. A. Morling & Son, Cameron, Ill.

3—If two batteries are to be charged they can be 6 volt batteries only and should be connected in parallel, that is, both positive terminals connected together then from the combination positive leads a wire should go to one generator terminal and from the combination negative leads a wire should go to the other generator terminal or ground as the case may be. As to whether the current will divide absolutely equal depends on the condition of charge at the battery also on the condition of the plates, as to their age, degree of sulphation, etc. If it is desirable to find the exact amount of charge going to each battery a small ammeter can be connected in series with each one, so as to read the individual battery current only. Then if it is found that one battery is getting more than the other, it would be possible to put a small piece of iron wire in series with the battery that is getting too much current so as to force more current to go into the other battery. The use of such a resistance would, of course, be a matter of experiment.

Under most cases, however, if batteries are similar and are both discharged the current will divide very nearly equal, in fact, the charging system on some cars is based on this principle, for example, the Simms-Huff system on Maxwell car about 1916 model used what was essentially two 6-volt batteries and connected in series with each other to give 12 volts for starting and in parallel with other to receive charge at 6 volts from the generator when the engine was running.

Valve Stem Guide Puller

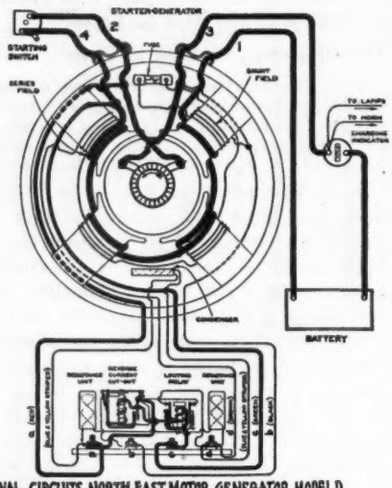
It is not necessary to disassemble the engine or to employ an arbor press to remove and replace valve stem guides, if the tool described is employed. This tool is simplicity itself and may be used on any L- or T-head engine.

It consists of a bushing screwed firmly into the spark plug hole. By turning the handle the valve stem guide is removed or replaced, as the case may be. In the case of a valve stem guide about to be replaced, the guide is slipped on the shank of the tool and then a washer backed by two nuts is put in place. Now, by turning the handle so that it screws up through the bushing, the guide is quickly drawn in place. To push a guide out the position of nuts and washer must be reversed.

MISCELLANEOUS INQUIRIES

Q—Give internal wiring diagram of the Northeast system used on 1915 Dodge cars.

1—The internal circuits of the motor generator used on the 1915 Dodge car are shown below.



INTERNAL CIRCUITS NORTH EAST MOTOR GENERATOR MODEL D 1915-16 DODGE *10055

2—Give a cut of the Air-friction carbureter for Fords. Will this carbureter give 30 miles to a gallon of gas?

2—Cut of the Air-friction carbureter is shown below, but we are unable to state as to the exact mileage you can get on a gallon of gas as this varies so much with conditions of driving and conditions of the engine.

Testing for Shorts and Grounds

3—In testing for shorts and grounds and open circuits on an electrical system does it pay to use an ammeter or lamp as long as heavy starter cable is not used or is there danger of burning out the ammeter?

3—In general it is not safe to use an ammeter in testing for grounds or shorts as even if small wire is used it is quite likely that when a connection is obtained the current will be in excess of what the ammeter is capable of carrying and may burn it out. The only place to use an ammeter is when the circuit is such that battery current flowing through the ammeter is sure to go through some other resistance such as an ignition coil or field winding or lamp before it can get back to the battery. If you will work from a wiring diagram of the car you will be able to see whether this will be the case. If an ammeter is used, however, in looking for shorts no harm is done as long as the short is not found but as soon as the short is located a very heavy rush of current goes through the ammeter and may cause trouble as above indicated. The use of a six volt lamp on a six volt system or a 12 volt lamp on a 12 volt system is safe, however, as the greatest voltage you can get is only sufficient to operate the lamp normally. A voltmeter is also recommended for locating shorts and grounds.

Intake Heater in Summer

4—Would a Jiffy intake heater which is a metal jacket which surrounds both the upper part of the intake manifold and the exhaust manifold be detrimental for use in summer?

4—While we are unable to say positively as to the exact effects of the intake heater in summer we would hazard the opinion that the amount of heat supplied to the intake manifold would not be sufficient to cause any serious loss of power. Of course, the only way to really tell would be to make a very careful exhaustive test in the summer both with and without the Jiffy heater but as stated above it is our opinion that the heater could be left on both winter and summer.

Ford Generator Cutout on Chevrolet

5—Can a cutout normally used on a Ford generator be used on a 490 Chevrolet?—A Wisconsin Reader.

5—While the Ford cutout which is mounted on the Ford generator is electrically suitable to replace the cutout mounted on the Chevrolet generator, you will find that it does not fit mechanically and would require a separate mounting, the labor involved probably costing you more than the difference in cost between the Ford cutout and the one which is designed for the Chevrolet generator. If the Ford cutout should be installed, however, it is still necessary to run the same wire to the ammeter which goes to the ammeter on the regular Ford installation. The frame or base of the cutout must still be grounded or attached to the generator and the forked terminal on the Ford cutout will have to be connected to the insulated terminal on the Chevrolet generator. You can tell which terminal is insulated by seeing which one has the fibre washer.

CHOOSING GEAR RATIO

Q—We are contemplating building a racing car and desire the following information. We are using a type 57 Cadillac 8 cylinder engine, 90 in. wheelbase and want to get a maximum speed of 70 m. p. h. We want to use 32 by 4½ tires. What type of rear axle would be best fitted for this car and what would the gear ratio need to be?

1—Any of the standard makes of axles should be suitable for this car, however, a light weight axle would be more desirable and if possible a full-floating axle. Assuming an engine speed of 3000 r. p. m. which this engine would easily turn up and with a gear ratio of 3½ to 1 the theoretical speed would be 82 m. p. h. Deducting this by 10 per cent to allow for slippage and losses through friction, etc., it would give a practical speed of in the neighborhood of 74 m. p. h. If the car is to be used on half mile dirt tracks we would recommend a 3¾ to 1 as best ratio for acceleration. The most efficient ratio for any certain type of racing is best determined by experiment. But based on calculations which are approximate but fairly accurate we would suggest the above ratios.

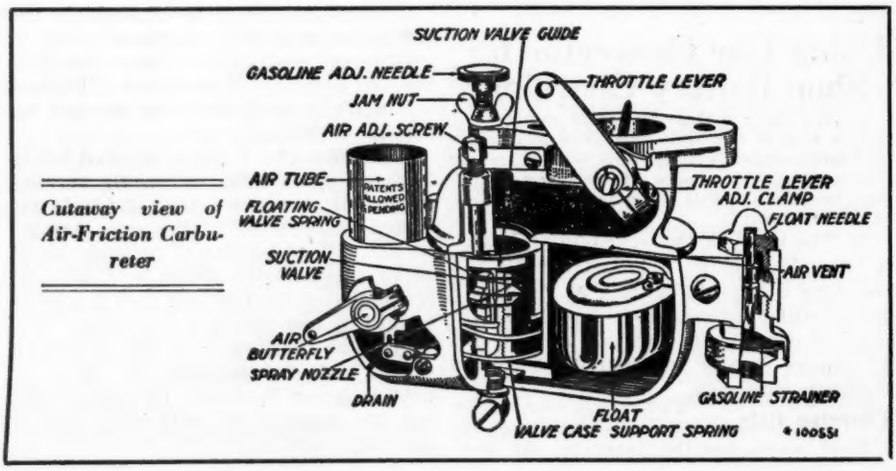
2—Where would it be possible to secure such an axle?—B. A. Felver, Grand Forks, N. D.

2—This is answered by letter.

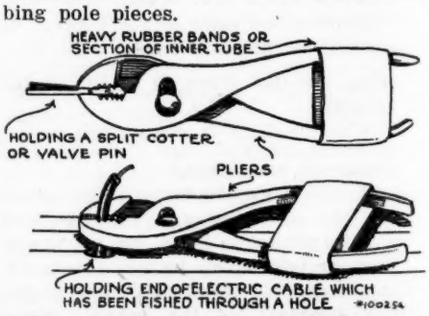
GENEMOTOR ON FORD

We are having trouble with a Genemotor installed on a Ford car which refuses to crank the engine although it will sometimes just barely turn the engine over and apparently is drawing an excessive current. We tried connecting different batteries directly to the terminal without improved results. Have also tried taking voltage across the terminal and found this to be only five or six volts. When the engine is running, however, the voltage at the terminals is as high as 14 volts. Publish diagram and give possible causes of this trouble.—A Reader, New Albin, Ia.

The fact that the generator shows 14 volts at the terminals when the engine is running indicates that it is all right as a generator. As trouble might possibly be in reversed connections in the shunt field would suggest lifting the third brush and trying it that way as a starter. Any trouble such as shorts or grounds in armatures or fields would ordinarily affect the generator operation as well, so we would suggest your looking for mechanical trouble such as armature rubbing pole pieces.



Cutaway view of Air-Friction Carbureter


HEAVY RUBBER BANDS OR SECTION OF INNER TUBE
HOLDING A SPLIT COTTER OR VALVE PIN
PLIERS
HOLDING END OF ELECTRIC CABLE WHICH HAS BEEN FISHED THROUGH A HOLE
*10025A

Use of rubber band or piece of inner tube in work with pliers

The ACCESSORY SHOW CASE

New Sources of Retail Profit

COMMON SENSE BODY POLISH

Common Sense Body Polish is the product of the Common Sense Mfg. Co., 500 N. Whittier st., St. Louis, and it is claimed, removes grease and dirt with the aid of a clean cloth.

REPUBLIC INTEGRAL TUBE

The Republic Rubber Co., Youngstown, O. is offering a new inner tube which they have named the Republic Integral Tube. This tube is all one piece without splice or seam, circular in form.

CAREFREE OUTFIT

The cut shows the Carefree Outfit ready for the night. The bed arrangement can be put away and a table brought out. The extended bed surface is 80 ins. long and 41 ins. wide. The table surface is 27 by 44 ins.—Carefree Outfit Co., 258 Reed Street, Milwaukee.

HARSHA STORAGE BATTERY

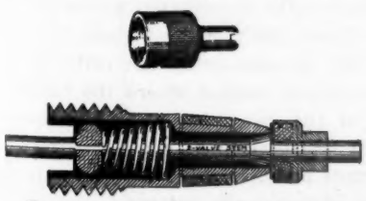
The battery is able to use more active material per plate by employing a corrugated plate construction. The posts are universal so that any type cable terminals can be used. An automatic valve lifts under pressure of gas and drops again when the pressure drops to prevent evaporation of the electrolyte. Harsha Battery Co., 31 East Van Buren Street, Chicago.

EMPIRE TIRE VALVES AND VALVE CAPS

The body of the Empire tire valve is brass and made in one piece, the valve stem being encased in the body. The spring is entirely enclosed in the body and the seat cup is made from brass rod. The Empire valve cap is made from brass, also. A rubber cushion on the inside of the cap is said to seal any possible leak in the valve. Empire Sales Co., 90 Silliman Ave., Bridgeport, Conn.

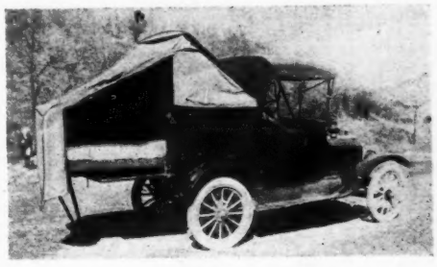
EVERFIRE SPARK PLUG

The Everfire Spark Plug has an inverted insulator or porcelain. The electrode and firing point are made of Monel steel. In cleaning, the terminal head and hexagon nut at the top of the plug should be removed and the insulator slipped out of the bottom of the shell. $1 each. Everfire Spark Plug Co., 3001 Olive street, St. Louis.



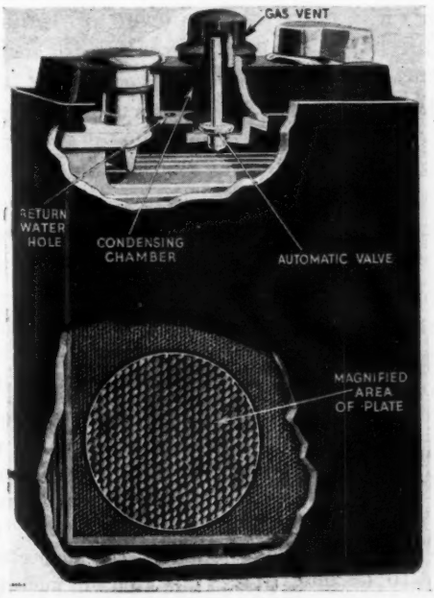
Empire tire valve and valve cap

Presto combination stop signal and parking light



Carefree outfit

Lace-On spring cover



Harsha battery

PRESTO COMBINATION STOP SIGNAL AND PARKING LIGHT

The Presto Combination Stop Signal and Parking Light signals are controlled by an automatic electric switch, operated by the foot brake. The lamp is fitted with two bulbs, one a two c. p. and the other a 21 c. p. The former is on a separate circuit and is used for parking, being controlled by a dash switch when used for parking. The latter bulb is used on the stop signal.

The body of the lamp is coated with baked black enamel. The reflector is made of brass, polished and nickel plated. Metal Specialties Mfg. Co., Chicago.

MILWAUKEE WATER CIRCULATING PUMP

This pump is made for the Fordson tractor and is driven off the fan belt of the Fordson. Cramer Mfg. Co., 387 10th St., Milwaukee, Wis.

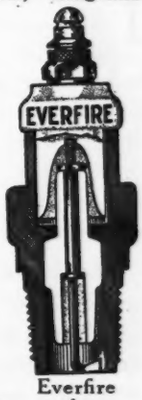
LACE-ON SPRING COVER

These lace-on covers are made exactly the right size for the springs. The covers have a felt lining which is saturated with oil when they are put on, and oil cups are provided to replenish the oil. The covers are made in two grades: an imitation leather, consisting of a strong cotton backing with a genuine nitro cellulose coating, which is unaffected by the action of oil or water. They are also made of genuine grain leather of very rich appearance.

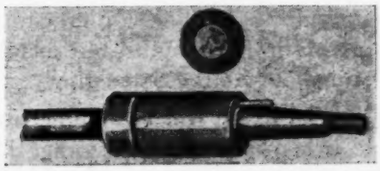
The price for cars with semi-elliptic springs is $7.50 per set for imitation leather, or $16 for genuine leather. Woodworth Specialties Co., Binghamton, N. Y.

BARNY'S EMERGENCY AXLE FOR FORDS

Intended to replace broken axles, the Barny Emergency Axle for Fords is made of cold rolled steel, to sell at $4.50. Hoeffler Robeschaud Co., 274 5th st., Milwaukee, Wis.



Everfire plug



Barny's emergency axle for Fords

LAMP BULB SIZES FOR 1920 CARS

Motor Age Maintenance Data Sheet No. 174

MAKE AND MODEL	Base Contact	Headlights		Sidelights		Taillights		Dashlights	
		Volts	C. P.	Volts	C. P.	Volts	C. P.	Volts	C. P.
Allen....43	Single	6-8	21	6-8	4	6-8	2	6-8	2
American....B	Single	6-8	21	6-8	4	3-4	2	*d3-4	2
Anderson....6									
Apperson	Single	6-8	21			6-8	2	6-8	2
Auburn....6-39	Single	6-8	21	6-8	4	6-8	2	6-8	2
Biddle....B1	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Bour-Davis....20	Single	6-8	21	6-8	4	6-8	4	d6-8	2
Brewster	Double	12-16	21	*6-8	4	6-8	2	d6-8	2
Briscoe	Single	6-8	21			6-8	2	d6-8	2
Buick....1920	Single	6-8	21	6-8	4	6-8	2	6-8	2
Cadillac	Single	6-8	18	6-8	4	3-4	2	*3-4	2
Case....V	Single	6-8	21	6-8	4	6-8	2	6-8	2
Chalmers	Single	6-8	21	6-8	4	6-8	2	6-8	2
Champion	Single	6-8	21	6-8	4	6-8	2	6-8	2
Chandler	Single	6-8	21	6-8	2	6-8	2	6-8	2
Chevrolet....490	Single	6-8	21			6-8	2	d6-8	2
Chevrolet....FB	Single	6-8	21			6-8	2	d6-8	2
Cleveland....40	Single	6-8	21			6-8	2	6-8	2
Cole	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Columbia	Single	6-8	17	6-8	4	6-8	2	d6-8	2
Comet	Single	6-8	21	6-8	6	6-8	2	6-8	2
Commonwealth	Double	6-8	21			s6-8	4	6-8	2
Crow-Elkhart	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Cunningham	Single	6-8	21	6-8	4	6-8	2	6-8	2
Daniels....8	Single	6-8	21	d6-8	2	6-8	2	d6-8	2
Davis....51	Single	6-8	21			6-8	2	6-8	2
Dixie Flyer....HS-50	Double	6-8	15			3-4	2	*3-4	2
Dodge Brothers	Single	12-16	15			12-16	2	12-16	2
Dorris	Single	6-8	15	6-8	4	6-8	2	6-8	2
Dort....15	Single	6-8	15			6-8	2	d6-8	2
Elcar....6	Single	6-8	15	6-8	4	6-8	2	d6-8	2
Elcar....4	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Elgin....6	Double	6-8	21			s-68	2	s6-8	2
Essex....A	Single	6-8	21			6-8	2	6-8	2
Ford....T	Double	9	18&27			6-8	2	6-8	2
Franklin	Double	12-16	21	12-16	4	6-8	2	*6-8	2
Grant	Double	6-8	15	s6-8	4	s6-8	2	s6-8	2
Hanson....54	Single	6-8	21			6-8	2	6-8	2
Harroun....6A2	Single	6-8	21			3-4	2	*3-4	2
Haynes	Double	6-8	21	6-8	2	6-8	2	6-8	2
Holmes	Double	12-16	21	12-16	4	12-16	2	12-16	2
Hudson....O	Single	6-8	21	6-8	4	6-8	2	6-8	2
Hupmobile....R	Single	6-8	21	6-8	2	6-8	2	6-8	2
Jones	Double	6-8	21			s6-8	2	6-8	2
Jordan....M	Single	6-8	21	6-8	4	6-8	2	6-8	2
Jordan....F	Single	6-8	21	6-8	4	6-8	2	6-8	2
King	Single	6-8	21	6-8	4	6-8	2	6-8	2
Kissel	Double	6-8	15			6-8	2	6-8	2
Kline Kar	Single	6-8	21			6-8	4	6-8	2
Lexington....S	Single	6-8	21			6-8	4	d6-8	2
Lexington....T	Single	6-8	21	6-8	2	6-8	4	d6-8	2
Liberty....6	Single	6-8	15	6-8	4	6-8	2	6-8	2
Locomobile	Single	6-8	21	6-8	4	6-8	2	6-8	2
Maibohm	Single	6-8	21			3-4	2	*3-4	2

MAKE AND MODEL	Base Contact	Headlights		Sidelights		Taillights		Dashlights	
		Volts	C. P.	Volts	C. P.	Volts	C. P.	Volts	C. P.
Marmon....34	Single	6-8	27			6-8	2	6-8	2
Maxwell	Single	6-8	21	6-8	4	6-8	2	6-8	2
McFarlan	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Mercer	Single	6-8	21	6-8	4	6-8	4	6-8	2
Meteor	Single	6-8	21	6-8	4	6-8	2	6-8	2
Metz	Single	6-8	21	6-8	4	6-8	2	6-8	2
Mitchell	Single	6-8	21			6-8	2	6-8	2
Moline-Knight	Double	s6-8	21	6-8	4	6-8	2	6-8	2
Monroe	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Moon....V	Single	6-8	21	6-8	4	6-8	2	6-8	2
Moon....6-68	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Nash....681	Single	6-8	21	6-8	4	6-8	2	d6-8	2
National Sextet	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Nelson	Double	12-16	21	12-16	4	12-16	2	12-16	2
Noma	Single	6-8	15	6-8	4	6-8	2	d6-8	2
Oakland	Single	6-8	15			6-8	2	6-8	2
Overland....4	Single	6-8	21			3-4	2	*3-4	2
Oldsmobile....37A	Single	6-8	21	6-8	4	6-8	2	6-8	2
Packard....Twin 6	Double	6-8	21	6-8	4	6-8	2	6-8	2
Paige....6-42	Single	6-8	15	6-8	4	6-8	2	d6-8	2
Paige....6-55	Single	6-8	15	6-8	4	6-8	2	6-8	2
Peerless....56	Single	6-8	21	6-8	4	6-8	2	6-8	2
Paterson	Single	6-8	15	6-8	4	6-8	4	6-8	2
Piedmont	Single	6-8	21			6-8	2	6-8	2
Pierce-Arrow	Single	6-8	21	6-8	4	6-8	4	6-8	4
Pilot	Single	6-8	21			6-8	2	6-8	2
Porter....45	Single	12-16	27	12-16	4	12-16	2	12-16	2
Premier....6-D	Single	6-8	21			6-8	2	d6-8	2
Reo....T6	Single	6-8	21			6-8	2	6-8	2
Revere....C	Single	6-8	21	6-8	4	6-8	2	6-8	2
Roamer....6-54	Double	6-8	21	6-8	4	6-8	2	d6-8	2
Scripps-Booth....B	Single	6-8	21	6-8	4	6-8	2	6-8	2
Seneca....L	Single	6-8	21			6-8	2	d6-8	2
Skelton....35	Single	6-8	21			6-8	2	d6-8	2
Spacke....S-20	Single	6-8	21			6-8	2	d6-8	2
Standard....8	Single	6-8	21	6-8	4	6-8	2	6-8	2
Stanley Steamer	Single	6-8	21	6-8	4	6-8	2	6-8	2
Stearns....SKL4	Single	12-16	27	12-16	4	12-16	2	12-16	2
Stephens....S6, 80	Single	6-8	15	6-8	4	6-8	2	6-8	2
Studebaker....L6	Single	6-8	12	6-8	4	6-8	2	6-8	2
Studebaker....S6	Single	6-8	12	6-8	4	6-8	2	6-8	2
Studebaker....B6	Single	6-8	12	6-8	4	6-8	2	6-8	2
Templar	Single	6-8	21	6-8	4	6-8	2	d6-8	2
Tulsa	Single	6-8	21			6-8	2	6-8	2
Velie....34	Single	6-8	21	6-8	2	6-8	4	6-8	2
Velie....48	Single	6-8	21	6-8	4	6-8	2	6-8	2
Westcott....C-38	Single	6-8	21	6-8	4	3-4	2	*3-4	2
Westcott....C-48	Single	6-8	21	6-8	4	3-4	2	*3-4	2
Winton....25	Single	6-8	21	6-8	4	6-8	2	6-8	2

s—single contact
d—double contact
*—in series with taillight

Why Lamp Bulbs Burn Out

IT IS often the experience of automotive dealers to meet car owners who have a mistaken idea as to the cause of bulbs burning out, the purchaser of new bulbs often saying, "Well, I had a short in my wiring last night, and burnt out all my lights." Such a condition is an electrical impossibility, as the only thing a short in the wiring will do is burn out a fuse, or if there are no fuses in the wiring system, a short may burn the ammeter or switch or part of the wiring.

The cause of all the lamps burning out at once is a break in the circuit from the generator to the battery. This break must be in such a place that while the battery has become disconnected from the generator, the lamps are not disconnected and receive the whole output of the generator, which is usually enough to burn them out instantly. Other causes also contribute to short life in lamp bulbs, but usually do not result in all burning out at the same time.

Natural usage will in time burn out the bulbs one at a time, while allowing the storage battery to become dry, will raise the generator voltage to the point where the life of the bulbs is short. The same effect will be produced by touring or running many hours each day, without any provision for using up the excess charge that is thus given to the storage battery. Under these circumstances the battery is kept up 7.5 volts while the generator voltage will be slightly higher, perhaps as much as 8 volts, and the lamps will then be operating at the high limit of the permissible voltage. Under these conditions their life is naturally shortened.

The remedy for high voltage under these circumstances is to use some device which uses the excess output of the generator, or to have the charging rate of the generator reduced, in case it is capable of being adjusted, or to burn the headlights while driving, to use the excess charge.

Other causes rather infrequently encountered, are to be found in high resistance connections either in the battery itself, due to a poor lead burning job in connecting the cells, or in a high resistance due to corroded contact where the battery is grounded to the frame of the car. A voltmeter connected across the suspected high resistance will show up trouble of this kind but such tests must be made while the engine is running and the generator is charging the battery.

LAMP BULB SIZES FOR 1921 CARS

Motor Age Maintenance Data Sheet No. 174

MAKE AND MODEL	HEADLIGHTS					SIDELIGHTS				DASH-LIGHTS			TAILLIGHTS					
	BULBS			FUSES		BULBS			FUSES	BULBS			BULBS			FUSES		
	Type of Base	Voltage	C. P.	Type	Amperes	Type of Base	Voltage	C. P.	Type	Amperes	Type of Base	Voltage	C. P.	Type of Base	Voltage	C. P.	Type	Amperes	Are Base and Taillamps in Series?	Is Sidelight in Headlight?
Ace G	D	6-8	21	none*		S	6-8	4	none*		S	6-8	2	S	6-8	2	none*		no	no
Allen 43	S	6-8	15	glass	30§	S	6-8	4	glass	30	S	6-8	2	S	6-8	2	glass	30§	no	yes
Ambassador	S	6-8	50		15	S	6-8	4		15	S	6-8	2	S	6-8	2			no	yes
American C	S	6-8	15			S	6-8	4			D	3-4	2	S	3-4	2			no	yes
Anderson 40	S	6-8	17								S	6-8	2	S	6-8	2			no	no
Apperson 8-21	S	6-8	18	wire	10	S	6-8	4	wire	10	D	6-8	2	S	6-8	2	wire	10	no	no
Auburn 6-39	S	6-8	21	none*		S	6-8	4	none*		D	6-8	2	S	6-8	2	none*		no	no
Beggs Six 20-T	D	6-8		§					§		D	3-4		D	3-4		§		yes	yes♦
Bour-Davis 21-S	S	6-8	21	cart	15	S	6-8	4	cart	15	S	6-8	2	S	6-8	2	cart	15	no	yes
Brewster 91	S	12-16	21	glass	10	S	12-16	4	glass	5	D	6-8	2	S	6-8	2	glass	5	yes	yes
Briscoe 4-34	S	6-8	21	§					§		D	6-8	2	S	6-8	2	§		no	no
Buick	S	6-8	21			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Cadillac 59	S	6-8	17	*		S	6-8	8	*		S	3-4	2	S	3-4	2	*		yes	no
Case V	S	6-8	21	none		S	6-8	8	none		S	6 8	2	S	6-8	4	none		no	yes
Chalmers	S	6-8	21			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Champion Special	S	6-8	21			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Chandler	S	6-8	21	cart	20	S	6-8	4	cart	4	S	6-8	2	S	6-8	2	cart	20	no	yes
Chevrolet 490	S	6-8	21		5					4	S	6-8	2	S	6-8	4			no	...
Chevrolet FB	S	6-8	21								S	6-8	2	S	6-8	4			no	...
Cleveland 40	S	6-8	17	glass	20	S	6-8	4	§§		S	6-8	2	S	6-8	2	§§		no	yes♦
Climber S	S	6-8	21	§			6-8	4	§		D	6-8	4	S	6-8	4	§§		no	yes
Cole 870	S	6-8	21	none		S	6-8	4	none		S	6-8	4	S	6-8	4	none		no	yes
Columbia Six	S	6-8	17	none		S	6-8	4	none		D	6-8	2	S	6-8	2	none		no	yes
Commonwealth 44	S	6-8	21			S	6-8	4			D	6-8	2	S	6-8	2			no	yes
Crawford 21-6-40	S	6-8	15	slip	15	S	6-8	4	slip	15	S	6-8	4	S	6-8	2	slip	15	no	yes
Crow-Elkhart	S	6-8	21	none		S	6-8	4			D	6-8	2	S	6-8	2			no	...
Cunningham V-4	S	6-8	21	none		S	6-8	4	none		S	6-8	2	S	6-8	2	none		no	yes
Daniels D-19	S	6-8	21	none		S	6-8	4	none		D	6-8	2	S	6-8	2	none		no	yes
Davis 51	S	6-8	15			S	6-8	4			S	6-8	4	S	6-8	2			no	yes
Dixie Flyer HS-70	D	6-8	15	enc	10						D	3-4	2	D	3-4	2	enc	10	no	...
Dodge Brothers	S	12-16	15								S	12-16	2	S	12-16	2			no	yes♦
Dorris 6-80	S	6-8	15	5-A	15	S	6-8	4	5-A	15	S	6-8	2	S	6-8	2	5-A	15	no	no
Dort 17-A	S	6-8	15								D	6-8	2	S	6-8	4			no	no
DuPont A	S	6-8	21	cart	§ 25	S	6-8	4	§§		D	6-8	2	S	6-8	2	§§		no	no
Elcar 7-R	S	6-8	17	*		S	6-8	4	*		D	6-8	2	D	6-8	2	*		no	yes
Elgin K	S	6-8	21	enc	20	S	6-8	4	§		S	6-8	2	S	6-8	2	§.....		no	yes
Essex A	S	6-8	15	none		S	6-8	2	none		S	6-8	2	S	6-8	2	none		no	no
Ferris	S	6-8	21			S	6-8	4			S	6-8	4	S	6-8	4			no	yes
Ford T	S	6-8	21									6-8	2						no	yes♦
Franklin 9-B	D	12-16	21			D	12-16	4			D	6-8	2	D	6-8	2			yes	yes
Friend Four	S	6-8	15								D	6-8	2	S	6-8	2			no	...
Gardner G	S	6-8	15	cart.	20						S	6-8	2	S	6-8	2	cart.	20	no	yes♦
Grant Six HX	S	6-8	15	glass	15	S	6-8	2	glass	15	S	6-8	2	S	6-8	2	glass	15	yes	yes
Halladay 21	S	6-8	21			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Hanson 60	S	6-8	21								D	6-8	4	S	6-8	4			no	yes♦
Harroun AA-2	S	6-8	21	cart.	5						D	3-4	2	D	3-4	4			yes	no
Hatfield A-42	S	6-8	15			S	6-8	4			D	6-8	4	S	6-8	2			no	yes
Haynes 47	S	6-8	15	*		S	6-8	4	*		S	6-8	2	S	6-8	2	*		no	yes
H. C. S. Series 3	S	6-8	21			S	6-8	4			D	6-8	2	S	6-8	2			no	yes
Holmes Series 4	D	12-16	21	2-A	15	D	12-16	4			D	12-16	2	D	12-16	2			no	yes
Hudson Super 6	S	6-8	15	none		S	6-8	4	none		S	6-8	2	S	6-8	2	none		no	yes
Hudson O	S	6-8	15			S	6-8	2			S	6-8	2	S	6-8	2			no	no
Hupmobile R	S	6-8	15	glass	10				glass	10	S	6-8	2	S	6-8	2	glass	10	no	no
Jackson 6-38	S	6-8	17	cart.	15	S	6-8	4			D	3-4	2	S	3-4	2			yes	yes
Jordan M	S	6-8	21	none		S	6-8	4	none		S	6-8	2	S	6-8	2	none		no	yes
Kenworthy 8-90	S	6-8	30			D	6-8	15						S	6-8	4			no	yes
King H	S	6-8	15	cart.	10	S	6-8	4	cart.	10	S	6-8	2	S	6-8	2	cart.	10	no	yes
Kissel Kar	S	6-8	15	A-3	20	S	6-8	4	A-3	20	S	6-8	2	S	6-8	2	A-3	20	no	yes
Kline Kar 6-55-K	S	6-8	17	cart.	15				cart.	5	S	6-8	2	S	6-8	2	cart.	5	no	yes
Kurtis A	S	6-8	32			S	6-8	4			S	6-8	2	S	6-8	4			no	yes
LaFayette 134	S	6-8	21	none*		S	6-8	4	none*		S	3-4	2	S	3-4	2	none*		yes	no
Leach Power Plus 6	S	6-8	27			S	6-8	4			S	6-8	4	S	6-8	2			no	no
Lincoln	S	6-8	21	none		S	6-8	4	none		S	3-4	2	S	3-4	2	none		yes	yes
Lexington S	S	6-8	21	glass	15						D	6-8	4	S	6-8	2	glass	5	no	no
Lexington T	S	6-8	21	glass	15						D	6-8	4	S	6-8	2	glass	15	no	no
Liberty	S	6-8	15			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Locomobile 48	S	6-8	21			S	6-8	4			S	6-8	2	S	6-8	2			no	no
Lorraine 21-T	S	6-8	17			S	6-8	4			S	6-8	2	S	6-8	2			yes	yes
Maibohm B	S	6-8	17	2-A	20				2-A	20	S	6-8	2	S	6-8	2	2-A	20	no	no
Marmon 34	S	6-8	27	none							S	6-8	2	S	6-8	2	none		no	yes
Maxwell	S	6-8	21			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
McFarlan 1921	S	6-8	32	glass	10	S	6-8	2	glass	10	D	6-8	2	S	6-8	2	glass	10	no	no
Mercer Series V	S	6-8	21			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Merit B	S	6-8	21			S	6-8	4			S	3-4	2	S	3-4	2			yes	yes
Metz M-6	S	6-8	16	§		S	6-8	4	§		S	6-8	2	S	6-8	2	§		no	yes
Meteor R & RR	S	6-8	16		5	S	6-8	2		5	S	6-8	2	S	6-8	2		5	no	no
Mitchell F-40	S	6-8	21								D	6-8	2	S	6-8	2			no	yes
Moon 6-48-21	S	6-8	21			S	6-8	4			D	6-8	4	S	6-8	4			no	yes
Nash 681	S	6-8	21		20	S	6-8	4		20	S	6-8	2	S	6-8	2		20	no	yes
National BB	S	6-8	21	§	5	S	6-8	4	§	5	D	6-8	2	S	6-8	2	§	5	no	yes
Noma 1-C	S	6-8	15								S	6-8	2	S	3-4	2			yes	...
Oakland 34-C	S	6-8	17			S	6-8	2			D	6-8	2	S	6-8	2			no	yes
Oldsmobile 43-A	S	6-8	15	none					none		D	3-4	2	S	3-4	2	none		yes	yes
Overland 4	S	6-8	15								S	3-4	2	S	3-4	2			yes	no
Packard S-6	S	6-8	15	none		S	6-8	6	none		S	3-4	2	S	3-4	2	none		yes	no
Packard T-6	S	6-8	21	glass	10	S	6-8	2	glass	10	S	3-4	2	S	3-4	2	glass	10	yes	no
Paige 6-42	D	6-8	15	cart.	§20	S	6-8	4	§§		D	3-4	2	S	3-4	2	§§		yes	no
Paige 6-66	S	6-8	15	cart.	§20	S	6-8	4			S	6-8	2	S	6-8	2			no	no
Pan A	S	6-8	15			S	6-8	4			S	6-8	2	S	6-8	2			yes	yes
Pan American	S	6-8	21		15	S	6-8	4		15	S	6-8	2	S	6-8	2		15	no	yes
Paterson 6-50	S	6-8	8	none		S	6-8	8	none		D	3-4	4	S	3-4	4	none		yes	yes
Peerless 56	S	6-8	21	1-A	10	S	6-8	4	1-A	10	S	6-8	2	S	6-8	2	1-A	10	no	yes
Piedmont 4-30	S	6-8	12	none					none		S	6-8	2	S	6-8	2	none		no	yes
Piedmont 6-40	S	6-8	12	none					none		S	6-8	2	S	6-8	2	none		no	yes
Pierce-Arrow	S	6-8	21		10	S	6-8	4		10	S	6-8	4	S	6-8	4		10	no	yes
Pilot 6-50	S	6-8	21	none					none		D	6-8	2	S	6-8	2	none		no	yes
Porter 45	S	6-8	24			S	6-8	12			S	6-8	6	S	6-8	6			no	...
Porter 46	S	12-16	24	cart.	15	S	12-16	4	cart.	15	S	12-16	2	S	12-16	2	cart.	15	no	no
Premier 6-D	S	6-8	21	none		D	6-8	2	none		D	6-8	2	S	6-8	5	none		no	no
Ranger	S	6-8	15	glass	15	S	6-8	4	glass	15	S	6-8	2	S	6-8	2	glass	15	no	no
Rees	S	6-8	15			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Reo T-6	S	6-8	21	wire	5						S	6-8	2	S	6-8	2	wire	5	no	...
R. & V. Knight J	S	6-8	15		10					10	D	6-8	4	S	6-8	2		10	no	yes
R. & V. Knight R	S	6-8	15		10					10	D	6-8	4	S	6-8	2		10	no	yes
Roamer 6-54-D	S	6-8	15	2A	10						D	6-8	2	S	6-8	2			yes	.....
Rock Falls 14000	S	6-8	12			S	6-8	4			S	6-8	2	S	6-8	4			no	no
Saxon 125	S	6-8	15	glass	15	S	6-8	2	glass	15	S	6-8	2	S	6-8	2	glass	15	no	no
Sayers Six DP	S	6-8	21	none					none		D	6-8	4	S	6-8	2	none		no	.....
Scripps-Booth B39	S	6-8	21	glass							D	6-8	4	S	6-8	4			no	♦yes
Seneca	S	6-8	21	none					none		D	6-8	2	S	6-8	2	none		no	♦yes
Skelton 35	S	6-8	18	none					none		D	6-8	2	S	6-8	2	none		no	no
Standard	S	6-8	21								S	6-8	2	S	6-8	2			no	yes
Stanwood Six	S	6-8	30	glass	20	S	6-8	6	glass	20	S	6-8	4	S	6-8	6	glass	20	no	yes
Stearns-Knight	S	12-16	21	cart.		S	12-16	4	cart.		D	12-16	2	S	12-16	2	cart.		no	yes
Stephens 90	D	6-8	15			D	6-8	2			D	6-8	2	D	6-8	2			no	yes
Stevens-Duryea E	S	6-8	21	cart.	15	S	6-8	6	cart.	15	S	6-8	2	S	6-8	2	cart.	15	no	yes
Studebaker EJ	S	6-8	12	tube	10	none			none		S	6-8	2	S	6-8	2	tube	10	no	no
Studebaker EH	S	6-8	12	tube	10	S	6-8	4	tube	10	S	6-8	2	S	6-8	2	tube	10	no	no
Studebaker EG	S	6-8	12	tube	10	S	6-8	4	tube	10	S	6-8	2	S	6-8	2	tube	10	no	no
Stutz	S	6-8				S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Templar 445	D	6-8	21	cart.	15	S	6-8	4	cart.	15	D	6-8	2	S	6-8	2	cart.	15	no	yes
Tulsa E-1-2-3	S	6-8	21	tube	§15				§		D	6-8	2	S	6-8	2	§		no	no
Velie 48	S	6-8	21	open	15	S	6-8	2	open	15	S	6-8	4	S	6-8	2	open	15	no	yes
Velie 34	S	6-8	21	open	15				open	15	S	6-8	2	S	6-8	2	open	15	no	yes
Wasp 211	S	6-8	25			S	6-8	8			S	6-8	4	S	6-8	8			no	.....
Westcott C-38	S	6-8	15	none		none			none		D	3-4	2	S	3-4	2	none		yes	no
Westcott C-48	S	6-8	15	none		none			none		D	3-4	2	S	3-4	2	none		yes	no
Wharton A	S	6-8	50	cart.	30	S	6-8	2	cart.	20	S	3-4	2	S	3-4	2	cart.	10	yes	yes
Willys-Knight	S	6-8	30			S	6-8	4			S	6-8	2	S	6-8	2			no	yes
Winton Six	S	6-8	21	none		S	6-8	6	none		S	6-8	2	S	6-8	2	none		no	yes

*Circuit br'ker. §One fuse for all. ♦Resistance Used. D D'ble Contact. S S'gle Contact. C.P. Candle Power. glass-gl's t'pe. wire-wire t'pe

PISTON RING SIZES OF 1921 CARS

Motor Age Maintenance Data Sheet No. 175

THE recommendations given below may be safely used where the factory equipment has not been altered. In cases where replacement rings of a make different than the original equipment are desired it is advisable to include in the order all available information concerning the engine to which they are to be fitted. Aluminum alloy pistons **should** always be fitted with rings of the **concentric type.** The degree of ring oversize for worn pistons should be determined by measuring the cylinder bore with inside micrometers.

Make	Model	Rings per Piston	Ring Diameter	Ring Width	Make of Rings	Make of Engine
Ace	G	3	3¼	5/16	American	Guy
Allen	43	3	3½	5/16	Wasson	Own
Ambassador	R	3	2⅞	.....	.....	.....
American	C	3	3¼	5/16	.....	Herschell-Spillman
Anderson	40	3	3¼	5/16	Continental	Continental 7R
Apperson	8-21	3	3¼	5/16	Gill	Own
Auburn	6-39	3	3¼	5/16	Continental	Continental 7R
Beggs	20T	3	3¼	5/16	Continental	Continental 7R
Bour-Davis	21-S	3	3½	5/16	Continental	Continental 9N
Brewster	91	4	4	¼	.....	Own
Briscoe	4-34	3	3⅜	5/16	.....	Own
Buick	.....	4	3⅜	5/16	Own	Own
Cadillac	59	3	3⅛	5/16	Own	Own
Case	V	3	3½	5/16	Wasson	Continental 9N
Chalmers	35B	3	3¼	5/16	Own	Own
Champion	Special	3	3½	5/16	.....	Herschell-Spillman
Chandler	.....	3	3½	5/16	.....	Own
Chevrolet	490	3	3 1/16	5/16	.....	Own
Chevrolet	FB	3	3 1/16	5/16	.....	Own
Cleveland	40	3	3	5/16	Wasson	Own
Climber	S Six	3	3¼	5/16	H. S.	Herschell-Spillman 11000
Cole Aero	870	4	3½	5/16	.....	Northway 309
Columbia	Six	3	3¼	5/16	Continental	Continental 7R
Commonwealth	44	3	3½	5/16	.....	Herschell-Spillman
Crawford	21-6-40	3	3½	5/16	Continental	Continental 9N 7000
Crow-Elkhart	L	3	3½	5/16	.....	.....
Cunningham	V-4	3	3¾	5/16	Eco	Own
Daniels	D19	3	3½	5/16	Pedrick	Own
Davis	51	3	3¼	5/16	Continental	Continental 7R
Dixie Flyer	H S 70	3	3½	5/16	H. S.	Herschell-Spillman 7000
Dodge Brothers	.....	3	3⅞	5/16	Own	Own
Dorris	6-80	3	4	¼	Indiana	Own
Dort	17-A	3	3½	5/16	Indiana	Dort-Lycoming
DuPont	A	3	3 15/16	5/16	Wasson	Own
Elcar	7-R	3	3¼	5/16	Own	Continental 7R
Elgin Six	K	3	3½	5/16	.....	Falls X3
Essex	A	3	3⅜	5/16	.....	Own
Ferris	.....	3	3½	5/16	Continental	Continental 9N
Ford	T	3	3¾	¼	.....	Own
Franklin	9-B	3	3¼	5/16	.....	Own
Friend	Four	3	3¼	5/16	American	Lycoming K
Gardner	G	3	3½	5/16	.....	Supreme S4
Globe	B-10	3	3⅜	5/16	.....	Own
Grant Six	HX	3	3 1/16	5/16	Own	Rutenber
Halladay	21	3	3½	5/32	Rutenber	Rutenber 22
Hanson	Six - 60	3	3¼	5/16	Continental	Continental 7R
Harroun	AA-2	3	3¼	¼	Own	Own
Hatfield	A-42	3	3½	5/16	H-S	Herschell-Spillman 7000
Haynes	47	3	3½	5/16	American	Own
H. C. S.	Series 3	3	3⅝	¼	.....	Weidley
Holmes	Series 4	3	3½	5/16	.....	Own
Hudson	Super 6	3	3½	5/16	Standard	Own
Hupmobile	Series R	3	3¼	5/16	Wasson	Own
Jackson	6-38	3	3¼	5/16	.....	Continental 7R
Jordan	M	3	3¼	5/16	Continental	Continental 7R
Konworthy	8-90	3	3	5/16	Gill	Own
King	H	2	3	5/16	.....	Own
Kissel Kar	.....	3	3⅝	5/16	U. S.	Continental 7R
Kline Kar	6-55-K	3	3¼	5/16	No Leak	Herschell-Spillman 11000
Kurtz	A	3	3¼	¼	H. S.	Own
LaFayette	134	3	3¼	5/16	.....	Continental 9N
Leach	.....	3	3½	5/16	Gill	Own
Lincoln	.....	3	3⅜	5/16	.....	Continental 7R
Lexington	S	3	3¼	5/16	Continental	Ansted T
Lexington	T	2	3¼	5/16	Wainwright	Own
Liberty	.....	3	3⅛	5/16	Own	.....

Make	Model	Rings per Piston	Rings Diameter	Rings Width	Make of Rings	Make of Engine
Locomobile	48-2	3	4½	¼	Own	Own
Lorraine	21-T	3	3½	5/16	.....	Herschell-Spillman 7000
Maibohm	B	3	3⅛	5/16	.....	Falls XM
Marmon	34	3	3¾	5/16	.....	Own
Maxwell	.....	3	3⅝	5/16 & ⅛	.....	.....
McFarlan	1921	3	4½	¼	Harward	Own
Mercer	Series V	3	3¾	5/16	.....	Own
Merit	B	3	3 1/16	5/16	.....	.....
Metz	M6 192T	3	3⅛	5/32	American	Rutenber 25
Meteor	R & RR	3	4¼	5/16	McQuay Norris	Rochester-Duesenberg G3
Mitchell	F 40	3	3¼	5/16	.....	Own
Moon	6-43-21	3	3¼	5/16	.....	Continental 7R
Nash	Four	3	3¼	5/16	.....	Own
Nash	683	4	3¼	5/16	Wasson	Own
National	Senbet BB	3	3½	5/16	Wasson	Own
Noma	1C	3	3¼	5/16	Continental	Continental 7R
Oakland	34C	3	2 15/16	5/16	.....	Own
Oldsmobile	43A	3	3 1/16	5/16	Muskegan	Own
Overland	4	3	3⅜	5/16	Own	Own
Packard	Simple 6	3	3⅜	5/16	.....	Own
Packard	Twin 6	3	3	5/16	.....	Own
Paige	6-42	3	3¼	5/16	Wasson	Own
Paige	6-66	3	3¾	5/16	.....	Continental 8A
Pan	A	4	3¼	5/16	Wasson	Own
Pan-American	6-66-55	3	3¼	5/16	.....	Herschell-Spillman 11000
Paterson	6-50	3	3¼	5/16	.....	Continental 7R
Peerless	56	3	3¼	5/16	Wasson	Own
Piedmont	4-30	3	3½	5/16	Lycoming	Lycoming
Piedmont	6-40	3	3¼	5/16	Continental	Continental 7W
Pierce-Arrow	.....	3	4	5/16	American	Own
Pilot	6-50	3	3¼	5/16	H. S.	Herschell-Spillman 11000
Porter	46	3	4⅜	¼	Wasson	Own
Premier	6-D	3	3⅜	5/16	Wasson	Own
Raleigh	A-6-60	3	3¼	5/16	.....	Herschell-Spillman 11000
Ranger	.....	3	3⅜	5/16	Supreme	Own
Rees	A 1921	3	2¾	5/16	Own	Own
Reo	T-6	3	3 1/16	5/16	Own	Own
R. & V. Knight	J	3	3½	5/16	Piston Ring Co.	Own
R. & V. Knight	R	3	3¾	5/16	Piston Ring Co.	Own
Roamer	6-54-D	3	3½	5/16	.....	Continental 9N
Revere	.....	3	4¼	¼	.....	.....
Rock Falls	14000	3	3¾	5/16	.....	Continental 8A
Saxon	125	4	3⅜	5/16	.....	Root & Vandervoort
Sayers Six	D. P.	3	3¼	5/16	Continental	Continental 7R
Scripps-Booth	B-39	3	2 15/16	5/16	.....	Northway 111
Seneca	.....	3	3½	5/16	.....	LeRoi 2-C
Skelton	35	3	3½	5/16	.....	Lycoming X
Standard	J	3	3¼	5/16	.....	.....
Stanwood Six	.....	3	3¼	5/16	American	Continental 7R
Stearns-Knight	SKL4	3	3¾	5/16	Perfection	Own
Stephens	90	3	3¼	5/16	Own	Own
Stevens-Duryea	E	3	4 1/16	¼	Own	Own
Studebaker	Light 6	3	3⅛	5/16	Own	Own
Studebaker	Special 6	4	3½	5/16	Own	Own
Studebaker	Big 6	4	3⅞	5/16	Own	Own
Stutz	Series 3	3	4⅜	¼	.....	.....
Templar	445	4	3⅜	5/16	Victory	Own
Tulsa	E-1-2-3	3	3½	5/16	.....	Herschell-Spillman 7000
Velie	48	3	3¼	5/16	.....	Continental 7R
Velie	34	3	3⅛	5/16	.....	Falls 15
Wasp	211	3	4⅜	¼	Own	Wisconsin
Westcott	C-38	3	3¼	5/16	Continental	Continental 7R
Westcott	C-48	3	3½	5/16	Continental	Continental 9N
Wharton	A	2	4	¼	American	Curtiss OX5
Willys-Knight	20	4	3⅝	5/16	Own	Own
Winton Six	25	3	3¾	¼	.....	Own

FAN BELT SIZES AND TYPES FOR 1922 TRUCKS

Motor Age Maintenance Data Sheet No. 176

NAME AND MODEL	Capacity	Type of Belt	Width of Belt	Length of Belt	Degree of Angle if Vee Type
Ace	1½	flat	1	37½	
Acme G	¾	vee	¾	38¾	60°
Acme B	1	vee	¾	38¾	60°
Acme F	1½	flat	1¼	40	
Acme A	2-2½	vee	¾	33¾	63°
Acme AC	2½	flat	1¼	33½	
Acme C	3½	flat	1¼	39½	
Acme E	5	flat	2	40½	
Akron Multi Truck (Now Thomart Speed truck)	1¼	flat	2	36½	
Atterbury 20R	1½	flat	1¼	38 11/16	
Atterbury 7CX	2½	flat	1¼	30¼	
Atterbury 7DX	3½	flat	1¼	30¼	
Atterbury 8E	5	flat	2	40	
Autocar XXI-F	1½-2				
Autocar XXI-G	1½-2				
Autocar XXVII-K	2	flat	2	47	
Autocar XXVII-H	2	flat	2	47	
Autocar XXVI-B	5	flat	2	49	
Autocar XXVI-Y	5	flat	2	49	
Available H1½	1½	flat	2	39½	
Available H2½	2½	flat	2	39½	
Available H3½	3½	flat	2	42½	
Available H5	5	flat	2	40½	
Belmont D	2	flat	2	34	
Bessemer G	1	vee	⅝	42	
Bessemer J2	2½	flat	1¼	36¼	
Bessemer H2	1½	vee	⅝	43	
Bessemer K2	4	flat	1½	33⅜	
Big 4 H	4	flat	2	32½	
Chevrolet G	¾	vee	21/32	9½	32°
Chicago C1½	1½	flat	2		
Chicago C2½	2½	flat	2		
Chicago C3½	3½	flat	2		
Chicago D5	5	flat	2		
Clydesdale 18	¾	vee	¾	42	
Clydesdale 20	1	vee	¾	42	
Clydesdale 42	1½	vee	¾	42	
Clydesdale 65EX	2½	flat	1½		
Clydesdale 65X	2½	flat	1½	40	
Clydesdale 90	3½	flat	1½		
Clydesdale 120B	5	flat	2	46½	
Collier 23	¾-1¼	flat	1	39½	
Collier 18	1	flat	1	39½	
Collier 19	1½	flat	1	39½	
Collier 21	2	flat	1	36½	
Collier 22	2½	flat	1	36½	
Columbia G	2½	flat	1¼	38	
Cyclone A	1½	flat	1¼	32¼	
Day-Elder A	1	vee	⅝	40	60°
Day-Elder B	1½-2	vee	⅝	40	60°
Day-Elder D	2-2½	vee	⅝	35	60°
Day-Elder C	2½-3	flat	2	36¾	
Day-Elder F	3½-4	flat	1½	35½	
Day-Elder E	5-6	flat	1½	38½	
Defiance G	1	flat	1¼	40	
Defiance D	1½	flat	1¼	40	
Defiance E	2	flat	1¼	40	
Denby 31	¾	vee	¾	41 9/16	60°
Denby 33	1½	vee	¾	41 9/16	60°
Denby 134	2	vee	¾	41 9/16	60°
Denby 25	3	vee	¾	41 9/16	60°
Denby 27	4	flat	1¼	32	
Denby 210	5	flat	1¼	32	
Dependable C	1½	flat	2	36	
Dependable E	2½	flat	2	36	
Dodge Bros	½	flat	1	31	
Derris K-4	2½	flat	2	42¼	
Derris K-7	3½	flat	2	43½	
Dort 103-5-7-9	½	flat	1	28⅜	
Duty 1922	2	flat			
Eugol 752	1	flat	1½	32¼	
Facto	2½	flat	2	35½	
Fageol	1½-2	Chain	belt us	ed	
Fageol	2½-3	flat	1½	30	
Fageol	3½-4	flat	1½	40¼	
Fageol	5-6	flat	1½	40¼	
Ford TT	1	flat	1⅜	27⅜	
F. W. D. B	3	flat	1⅞	40	
Fulton A	1	flat	1½	36½	
Fulton C	2	flat	1½	36½	
Gersix K	2½	flat	2	36	
G. M. C. K-16	1	vee	21/32	35⅞	38°
G. M. C. K-41A	2	vee	⅞	38 7/16	38°
G. M. C. K-71A	3½	vee	⅞	38 7/16	38°
G. M. C. K-101A	5	vee	⅞	38 7/16	38°
Hall	2½	flat	1¼	37	
Hall	3½	flat	1½	39	
Hall	5	flat	1½	39	
Hall	5-7	flat	1½	39	
Harvey WEA	1½	flat	1	32	
Harvey WOA	2	flat	1	32	
Harvey WFA	2½		1¼	35	
Harvey WHA	3½	flat	1½	36	
Harvey WKA	5	flat	1¼	36	
Huron Erie	1½-2	flat	2	36	
Huron Mich.	2½-3	flat	2	38	
Indiana 12	1½				
Indiana 20	2				
Indiana 25	2½				
Indiana 35	3½				

NAME AND MODEL	Capacity	Type of Belt	Width of Belt	Length of Belt	Degree of Angle if Vee Type
Indiana 51	5				
International S	¾	flat	1	30	
International 21	1	flat	1⅛	37⅝	
International 31	1½	flat	1⅛	37⅝	
International 41	2	flat	1⅛	37⅝	
International 61	3	Gear	driven	fan	
International 101	5	Gear	driven	fan	
Kalamazoo G1	1½	vee	¾	41½	60°
Kalamazoo G2	1½	flat	1¼	40	
Kalamazoo H	2½	flat	2	42	
Kalamazoo K	3½	flat	2	42	
Kalamazoo K-5	5	flat	2	42	
Kearns H	1	flat	1	37	
Kearns N	2	flat	1	37	
Kelly-Springfield K-34	1½				
Kelly-Springfield K-38	2½				
Kelly-Springfield K-41	3½				
Kelly-Springfield K-50	5				
Kelly-Springfield K-60	6				
Keystone	2				
Kimball AB	2				
Kimball AC	2				
Kimball AK	3				
Kimball AE	4				
Kissel Exp.	1	flat	2	46¾	
Kissel G.D.	1½	flat	2	46¾	
Kissel Frghter	2½	flat	2	40	
Kissel Frghter	2½	flat	2	40	
Kissel H.D.	3½	flat	2	52¼	
Kleiber	1	flat	1⅜	45½	
Kleiber	1½	flat	1⅜	45½	
Kleiber	2	flat	1⅜	45½	
Kleiber	2½	flat	1⅜	47½	
Kleiber	3½	flat	1⅜	47½	
Kleiber	5	flat	2	41¾	
Lange E	2½	flat	1½	42	
Lange EA	2½	flat	1½		
Larrabee X-2	1	flat	1¼	34	
Larrabee J-4	1½	flat	1¼	41	
Larrabee K-4	2½	flat	1½	48	
Larrabee L-4	3½	flat	1½	48	
Larrabee EW	5	flat	2	40	
Luedinghaus	1				
Luedinghaus	1½				
Luedinghause	2-2½				
MacDonald A	7½	flat	2		
Mack AB	1½	flat	1½	33	
Mack AB	2	flat	1½	33	
Mack AB	2½	flat	1½	33	
Mack AC	3½	vee	1	93½	45°
Mack AB	5	flat	1½	33	
Mack AC	5	vee	1	93½	45°
Mack AC	6½	vee	1	92½	45°
Mack AC	7	vee	1	93½	45°
Mack AC	7½	vee	1	93½	45°
Mack AC	10 tr.	vee	1	93½	45°
Mack AC	13 tr.	vee	1	92½	45°
Mack AC	15 tr.	vee	1	93½	45°
Menominee HT	1	flat	1¼	33¾	
Menominee H	1½	flat	1¼	33¾	
Menominee D	2	flat	2	37¾	
Menominee G	3½	flat	2	37¾	
Menominee J3	5	flat	2	40¾	
Napoleon 9	1	flat	1	36	
Netco DK	2	flat	1½	40 7/16	
Netco HL	2½		1½	41¼	
Niles E	2		¾	33	
Noble B30	1½	flat	1⅞	33¾	
Noble C40	2	flat	1⅞	34¼	
Noble D50	2½	flat	1⅞	34¼	
Noble E70	3½	flat	1⅞	34¼	
Norwalk 25E	1	flat	¾	29	
Norwalk 35E	1½	flat	¾	29	
Norwalk 35E, Spec.	2	flat	2	36 1/12	
Olympic R	2½	flat	2	33½	
Packard EX	2	vee	4/5	41 9/16	45°
Packard EC	2	vee	4/5	41 9/16	45°
Packard ED	3	vee	4/5	43 9/16	45°
Packard EF	5	vee	4/5	43 9/16	45°
Paige 52-19	1½	flat	2	36	
Paige 54-20	2½	flat	1¼	37⅝	
Paige 51-18	3½	flat	2	37⅝	
Parker G1	2½	flat	2	38	
Parker J20	3½	flat	2	38	
Parker M20	5	flat	2	39½	
Patriot Revere	1	flat	1¼	19	
Patriot Lincoln	2	flat	1⅞	18	
Patriot Washington	3	flat	1⅞	19	
Pierce-Arrow X5	2	flat	1½	44	
Pierce-Arrow W2	3½	flat	1½	44	
Pierce-Arrow R10	5	flat	1½	44	
Pittsburgh C-21	3	flat	2	43¼	
Rainier R-21	¾	vee	⅝	43¾	60°
Rainier R-19	1	vee	⅝	43¾	60°
Rainier R-16	1½	vee	⅝	43¾	60°
Rainier R-18	2	flat	1¼	33¾	
Rainier R-20	2½	flat	1½	40	
Rainier R-15	3½	flat	1½	41	
Rainier R-17	5				
Reo F	¾-1¼	flat	⅞	39½	
Republic 75	¾	flat	1		

NAME AND MODEL	Capacity	Type of Belt	Width of Belt	Length of Belt	Degree of Angle if Vee Type
Republic 10	1	flat	1¼		
Republic 10E	1	flat	1¼		
Republic 11X	1½	flat	1¼		
Republic 19	2½	flat	1¼		
Republic 19W	2½	flat	1½		
Republic 20	3½	flat	1½		
Rumely A	1½	flat	2	37	
Samson 15	¾	vee	1/16		40°
Samson 25	1¼	vee	½		40°
Sanford 125	2½	flat	1½	30	
Sanford 135	3½	flat	1½	32	
Sanford 150	5	flat	1½	32	
Schacht F	2	flat	2	37½	
Schacht F	3	flat	2	37½	
Schacht E	4	vee	⅞	39¼	45°
Schacht E	5	vee	⅞	39¼	45°
Schawartz A	1¼	flat	⅞	29½	
Schawartz B2W	2	flat	2	33⅛	
Schawartz C2W	3	flat	2	33⅛	
Schawartz DW	5	flat	2	38⅜	
Selden 1½A	1½				
Selden 2½A	2½				
Selden 3½A	3½				
Selden 5A	5				
Service 15	¾-1	flat	2	35	
Service 31	1½	flat	1¼	33	
Service 36	1½-2	flat	1¼	33	
Service 51	2½-3	flat	1¼	33	
Service 71	3½	flat	1¼	33	
Service 76	3½	flat	1½	38¼	
Service 101	5	flat	1½	38¼	
Standard 1K	1½	flat		39¼	
Standard 76	2½	flat	1¼	31¾	
Standard 66	3½	flat	1½	36½	
Standard 5K	5	flat	2	42¼	
Sterling	1½	flat	1½	32¾	
Sterling	2	flat	1½	32¾	
Sterling	2½	flat	1½	32¾	
Sterling	3½		1½	40	
Sterling	5	flat	1½	40	
Sterling	5	flat	1½	40	
Sterling	7½	flat	1½	40	
Sullivan E	2	flat	2	36	
Sullivan H	3½	flat	2	36	
Tiffin GW	1½	flat	1¼	32	
Tiffin MW	2½	flat	1¼	35	
Tiffin F35	3½	flat	1½	36	
Tiffin TW	5	flat	2	47	
Tiffin UW	6	flat	2	47	
Transport 20	1	flat	1		
Transport 30	1½	flat	1¼		
Transport 50	2½	flat	2		
Transport 50	2½	flat	1¼		
Transport 70	3½	flat	2		
Triangle AA	1	flat	1	34	
Triangle B	2½	flat	1¼	40	
Ultimate AL	2	flat	2	34	
Ultimate A	2	flat	2	34	
Ultimate B	3	flat	2	34	
Ultimate BL	3	flat	2	34	
U. S. N	1½	flat	1¼	37	
U. S. R	3	flat	1¼	35	
U. S. S	4	flat	1¼	37	
U. S. T	6	flat	2	38¾	
Velie 46	1½	vee	¾	41⅜	
Vulcan 25	2½	flat	2	38	
Walker-Johnson A	2	flat	1	37	
Walker-Johnson B	3	flat	1¼	33½	
Walter S	5	flat	1½	32	
White 15	¾				
White 15-45	¾				
White 20	2				
White 20-45	2				
White 40	3½				
White 45	5				
Wichita K	1				
Wichita L	1½				
Wichita M	2				
Wichita R	2½				
Wichita RX	2½				
Wichita O	3½				
Wichita S	5				
Wilcox AA	1				
Wilcox B	1¼	flat	1	35¼	
Wilcox C	2½	flat	1	35¼	
Wilcox E	3½	flat	2	39½	
Wilcox F	5	flat	2	41¾	
Winther 751	¾-1	flat	1	39½	
Winther 39	1½	flat	1¼	33¼	
Winther 430	1½	flat	1¼	30⅝	
Winther 49	2	flat	1¼	37½	
Winther 50	2½	flat	2	42¼	
Winther 450	2½	flat	1¼	30⅝	
Winther 70	3½	vee	2	42¼	
Winther 109	5	flat	2	42¼	
Winther 140	7	flat	2	42¼	
Witt-Will P	2½-3	flat	1¼	31	
Witt-Will P	2½	flat	1¼	31	
Witt-Will N	1½-2	flat	1¼	31	
Witt-Will N22	1½	flat	1¼	31	

Automotive Transportation Service for the Farmer Still in Its Infancy

Wonderful Progress in Rural Communities Expected in Next Five Years—National Highway Fleets Will Make Daily Deliveries—Possibilities of Truck Sales Almost Unlimited

By WM. C. MARKHAM

Representative of the American Association of State Highway Officials, affliated with American Farm Bureau Federation

THE use of automotive transportation by the farmer has hardly begun, despite the fact that there were 1,346,000 trucks in use over our highways in 1921. When we realize, however, that already 12,000 trucks are used in the country to take farmers' children to school, that hundreds of motor express lines with regular schedules have been established, that 6,000,000 head of cattle were transported by truck in 1021, it is sufficient to indicate the possibilities of automotive highway transportation.

Idea of Program

Some idea of the scope of the program of the American Association of State Highway Officials for a Highway Transportation System, which is, we believe, the foundation for almost unlimited possibilities of the utilization of trucks for farmers, may be secured from a paragraph description of the work to be done. Actual work has been under way now for two years, and the program is not merely one on paper.

The Highway Transportation System throughout the United States is 186,700 miles, of which 69,100 miles have already been improved or are in various stages of construction. This program of 186,700 miles constitutes only approximately seven per cent of the road mileage of the states, but is a representative seven per cent of roads in each state. In other words, the first seven per cent of good roads improved in each states are those roads which best serve the rural districts and afford a connecting link in each state for a national highway automotive transportation system. That part of the mileage which has been constructed by the use of Federal aid has been done at an average cost of $18,000 per mile, of which the Federal government has contributed 42½ per cent and the states 57½ per cent.

Investigation has clearly shown that up to a distance of 150 miles truck transportation is superior to railway transportation, and it is only by the development of a national highway transportation system that the greatest amount of benefit can be derived by the farmers.

It is not necessary to enumerate the advantages of automotive transportation in short line hauls, but an investigation among the 1,500,000 members of the American Farm Bureau Federation, which is co-operating with the Association of State Highway Officials, shows that within the past three years farmers in some states have about quit their own trucking.

The establishment of adequate automotive highway transportation system has made this possible, and the advantages are many, principally the saving in time of the farmer, and the saving of the uneconomical loss sustained by a farmer when he gets in his truck and goes to town for some sort of repairs or takes a load of produce into the city, returning home empty.

So firmly has Congress been "sold" on the idea of Federal aid in developing highway transportation, that I feel that it is a safe prediction to state that the question of Federal aid in the future, as a policy, is as thoroughly intrenched as rural mail delivery.

As a prediction for the future, the writer is also willing to hazard a statement that the next five years will bring about such strides in highway transportation that the average farmer will get his mail twice a day instead of once. He will also be served by highway transportation fleets making daily deliveries and offering 24-hour service to him in the shipment of produce to the city.

An Interesting Comparison

There is no better way to approach a study of the necessity for proper highway construction and upkeep of roads than an investigation of the cost of highways in relation to the cost of the methods used for transportation over the highways. Comparing the funds used for the construction of roads and the money of the people tied up in highway rolling stock of a motorized character, we find some very interesting comparisons.

Placing a value of $1,500 on each truck and $750 on each passenger car, we find that in 1910 the value of the motor vehicle investment was $386,250,000. That year we spent for new roads construction $95,000,000. The states expended for new construction from 1910 to 1916, inclusive, $1,056,000,000, but the motor vehicle investment had jumped to $2,822,250,000. The entire funds for road construction from 1910 to 1921 inclusive, was $2,526,000,000, while motor vehicle investments in 1921 had reached the peak of $8,322,000,000. Some idea of the strides that are being made in highway transportation systems may be gained from the fact that last year a total of $600,000,000 was spent by Federal, states and counties on its highway system.

Outlook Brighter

For the future, the outlook for a continuous and steady growth of our program is exceedingly bright. The Dunn bill appropriating $65,000,000 for the fiscal year ending June 30, 1923, and $75,000,000 for the following year, which is receiving the active support of our association, passed the House on May 1 and is now up for conference with the Senate, with the practical assurance that the appropriation will be passed to carry on the Federal aid program adopted under the National Highway Act.

To date something like $350,000,000 has been appropriated by the Federal government during the past five years in the national highway transportation system. A careful survey of the probable time necessary to complete the first step in the building of good highways throughout the country, which includes but 7 per cent of the total mileage, shows that the first 7 per cent of good roads, aggregating $186,700 miles, can be completed in 15 years if the Federal appropriations aggregate as much as $75,000,000 per year. On an appropriation of $100,000,000 per year, which is the sum recommended by the association, the first link of national highways could have been completed in ten years.

With the completion of this program, already well under way, giving to the farmers of America an adequate transportation system, over which they can have regular automotive transportation service, I feel perfectly confident in making the assertion that at the present time the use of automotive transportation by the farmer has hardly begun and the possibilities of sales by truck manufacturers in the transportation field are almost beyond limitation.

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Hartford, Conn.	Connecticut Fair Grounds	Sept. 4- 9
Spokane, Wash.	Annual Show	Sept. 4-9
Chicago	Annual Show of the Automotive Equipment Association	Nov. 13-18

RACES

Tacoma, Wash.	Eleventh Annual Race	July 4
Strasbourg	French Grand Prix	July 15
Colo. Spgs., Colo.	Pike's Peak Race	Sept. 4
San Carlos, Cal.	500-Mile Armistice Day Race	Nov. 11

FOREIGN SHOWS

Berlin	Kaiserdamm Hall	Sept. 25-Oct. 3
Rio de Janiero	Automotive Exhibition	Sept., 1922
London	International Commercial Vehicle Exhibition	Oct. 12-13
Paris, France	Automobile Show	Oct., 4- 15
London	Annual Show	Nov. 3-11

CONVENTIONS

Colo. Spgs., Colo.	Automotive Equipment Assn.	June 19-24
White Sul'r Spgs., W.Va.	S. A. E. Summer Meeting	June 20-24
Olympia	Washington Automotive Trade Assn.	July 21-22

TO REPORT STORED CARS

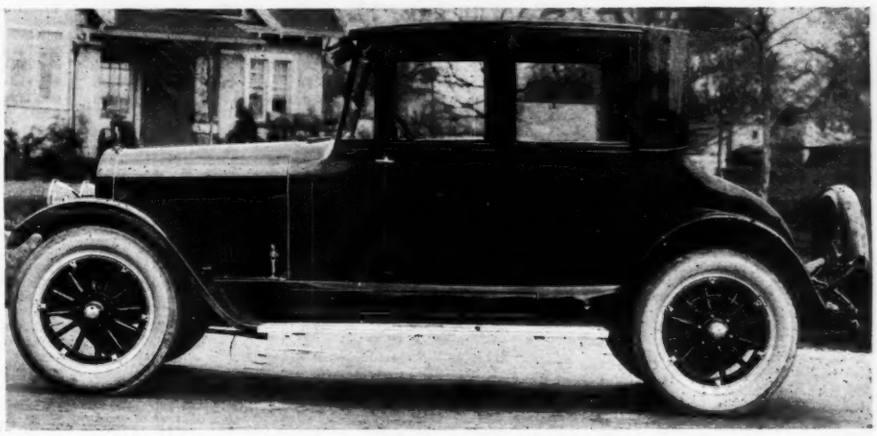
San Francisco, Cal., June 5—Garage owners of San Francisco and of several cities of northern California, have joined with the Motor Car Dealers' Assn. of San Francisco to prevent the storing of stolen cars in public garages. W. F. Culberson, president and Elliott M. Epsteen, prosecutor, of the San Francisco Motor Car Dealers' Assn., have been at work for more than a year on this project, and at last have obtained an agreement with the Garage Owners' Protective Assn., whereby the latter agree to furnish reports, twice a month, on each car which has been stored in any member's garage for 15 days preceding the date of the report. The agreement was concluded at a meeting between Arthur d'Ettel, secretary of the garage owners' organization; A. F. Lemberger, general manager of the Motor Car Dealers' Assn.; Captain of Detectives Duncan Matheson, and Sergeant of Police Arthur McQuaide, with Epsteen helping on the details.

AKRON TIRE PRODUCTION

Akron, O., June 5—Akron's tire production of over 85,000 casings a day which is 85 per cent of the peak output of 1920, is being obtained with scarcely more than 50 per cent of the total number of factory wage earners employed during the 1920 peak. This indicates a great improvement in the efficiency both of individual workers and factory methods. When Akron was turning out 100,000 tires a day the nine largest plants here were employing 72,000 wage earners. Today the number of wage earners in the same factories producing 85,000 casings a day is about 43,000.

8-WHEEL PASSENGER BUS

Akron, O., June 6—An eight-wheel passenger bus, an entirely new departure in motor vehicle design, is being developed by the Goodyear Tire & Rubber Co., of Akron, which two years ago pioneered in the successful development and practical demonstration of the six-wheel chassis for both trucks and passenger buses.



LATEST COLE BODY DESIGN

The new Cole Conventional Coupe is designed so the fourth seat folds up under the cowl, out of the way, when not in use. The standard color is Cole blue with blue cloth upholstering and black body panels, sheet metal parts and chassis. There is a luggage compartment

SALES INCREASE 30 PER CENT

Milwaukee, Wis., June 5—Despite the fact that May sales, added to those of April, reached such proportions that some believe the sources of current demand must be near exhaustion, dealers say their prospect files indicate that the remarkable buying movement of the last 90 days is likely to be duplicated in the next three months. Averaging reports from a dozen representative dealers, a gain of about 30 per cent in sales was made in May, compared with April.

Beware of Unauthorized Subscription Solicitors

From information received, it appears that a man purporting to be a salesman of the Automotive Periodical Sales Co., Wabash Building, Chicago, has been soliciting subscriptions for the Class Journal publications, *Motor Age, Motor World, The Tire Rate Book* and *The Commercial Vehicle.*

The Class Journal Co. has never authorized the Automotive Periodical Sales Co. or its representatives to solicit subscriptions for its papers and does not know anything about them.

Letters addressed to the Automotive Periodical Sales Co. have been returned to the writers unclaimed, and it has not been possible to locate them in Chicago.

The illustration is a fac-simile of the receipt of the representative of the Automotive Periodical Sales Co.

Special Offer

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Address all correspondence to Automotive Periodical Sales Co., Chicago, Ill.

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason	¾-1	$1650a	3¾x5	34x5n	34x5n	W
Acason....RB	1½	1950	3¾x5¼	36x3½	36x6	W
Acason....H	2½	2750	4⅜x5¾	36x4k	36x8k	W
Acason....L	3½	3450	4⅜x5¾	36x5k	36x10k	W
Acason....M	5	4350	5 x6¼	36x6	40x12	W
Ace	1½	2295	3¾x5½	34x3½k	34x5k	W
Ace....A	2½	2795	4¼x5½	36x4k	36x7	W
Acme	20	1	....	3¾x5	35x5n	35x5n	W
Acme	30	1½	....	3¾x5	34x3½	34x5	W
Acme	40	2	....	3¾x5	34x3½	34x5	W
Acme	60	3	....	4½x5½	36x4	36x7	W
Acme	60L	3	....	4½x5½	36x4	36x7k	W
Acme	90	4½	....	4½x5½	36x5	40x10	W
Acme	125	6¼	....	4¾x6	36x6	40x12	W
American	25	2½	3350	4 x6	36x4k	36x4dk	W
American	40	4	4275	4½x6	36x5k	36x5dk	W
Armleder	20	1	2350	3¾x5¼	34x3½k	34x5k	W
Armleder	21	1½	2425	3¾x5¼	34x3½	34x6	W
Armleder	40	1½	2850	4½x5¼	34x3½	36x6	W
Armleder	HW	2½	3200	4¼x5½	36x4k	36x7k	W
Armleder	KW	3½	4150	4½x6	36x5	36x5d	W
Atlas	MD	1	1185	3½x5	32x4½n	32x4½n	W
Atterbury	20R	1½	2475	3¾x5	34x3½	34x5	W
Atterbury	7CX	2½	3175	4½x5¼	36x4	36x4d	W
Atterbury	7D	3½	3975	4½x5½	36x5	40x5d	W
Atterbury	8E	5	4975	4¾x6	36x5	40x6d	W
Autocar	21UF	1½-2	1950	4¼x4½	34x4k	34x5k	D
Autocar	21UG	1½-2	2050	4¾x4½	34x4k	34x5k	D
Autocar	27H	2	2950	4 x5½	34x5	36x7	D
Autocar	27K2	2	3075	4 x5½	34x5	36x7k	D
Autocar	26Y	5	3950	4½x5½	34x6	36x12	D
Autocar	26-B	5	4100	4¼x5½	34x6	36x12	D
Available	H1½	1½	2475	4 x5	36x3½k	36x5k	W
Available	H2	2	2775	4 x5	36x3½k	36x6k	W
Available	H2½	2½	3160	4 x5	36x4k	36x8k	W
Available	H3½	3½	4175	4½x5½	36x5	40x5d	W
Available	H5	5	5375	5 x6	36x6	40x12	W
*Avery		1	....	3 x4	34x5n	34x5n	I
Beck	A Jr.	1	1850	3½x5	32x4½	33x5	I
Beck	B-30	1½	2050	3¾x5	34x5	36x6	
Beck	C-40	2	2150	3¾x5	36x6	36x6	
Beck	D-50	2½	2850	4½x5¼	38x7	40x8	
*Bell	(Penn.)	½	1000a	3½x5	31x4n	31x4n	B
Bell	M (Iowa)	1	1495	3½x5½	35x5	35x5n	W
Bell	E (Iowa)	1½	2100	3¾x5½	31x3½	31x5	I
Bell	O (Iowa)	2½	2550	4½x5½	34x4	34x6	I
Belmont	A	½	725	3¾x4¼	31x4	31x4	B
Belmont	D	2	2575	4¼x5½	34x3½k	34x6k	I
Belmont	F	3	3500	4 x6	36x5k	36x5dk	I
Bessemer	G	1	....	3½x5	35x5n	35x5n	I
Bessemer	H-2	1½	....	3¾x5	36x3½	36x5	I
Bessemer	J-2	2½	....	4½x5½	36x4	36x4d	I
Bessemer	K-2	4	....	4½x5½	36x5	36x10	I
Brinton	C	1½	1500	3¾x5	34x4	34x5	W
Brinton	D	2½	2250	4¼x5¼	36x4	36x7	W
Brockway	E	1	....	3¾x5⅛	35x5n	35x5n	B
Brockway	S-5	1½	....	3¾x5	36x3½k	36x5k	W
Brockway	SK	1½	....	4½x5¼	36x4	36x6	W
Brockway	KR	2½	....	4½x5½	36x4	36x8	W
Brockway	K-5	2½	....	4½x5¼	36x4	36x8	W
Brockway	RT	3½	....	4¾x6	36x5	36x10	W
Brockway	R-4	3½	....	4½x5½	36x5	36x5d	W
Brockway	T-4	5	....	4¾x6	36x6	40x6d	W
*Buick		...	945b	3⅜x4¾	31x4n	31x4n	B
Capitol	G1½	1½	2975	3¾x5	35x5	38x7	W
Capitol	H2½	2½	3700	4¼x6	36x4	39x8	W
Capitol	K2½	2½	4250	4¼x6	36x6	42x9	W
Capitol	M3½	3½	4425	4¼x6	36x5	36x10	W
Case		2	....	4¼x5¾	36x6	38x7	I
*Chevrolet	G	¾	745	3½x4	31x4n	34x4½n	B
*Chevrolet	T	1	1125	3½x5¼	33x4n	35x5n	W
Chicago	C1½	1½	....	4 x5	36x3½k	36x5k	W
Chicago	C2½	2½	....	4 x5	36x4k	36x7k	W
Chicago	C3½	3½	....	4½x5½	36x5	36x10	W
Chicago	D5	5	....	4½x5½	36x6	40x12	W
Clydesdale	10	¾-1½	1485	3¾x5	34x5n	34x5n	B
Clydesdale	18	¾-1½	1890	3¾x5	34x5	34x5	W
Clydesdale	20	1-1½	2385	3¾x5	34x5	34x5k	W
Clydesdale	42	1½-2	2475	3¾x5	36x3½	36x6	W
Clydesdale	65X	2½-3	3250	4½x5½	36x4	36x8	W
Clydesdale	65EX	2½-3	3150	4½x5½	36x4	36x8	W
Clydesdale	90	3½-4½	4100	4½x5½	36x5	36x10	W
Clydesdale	120	5-6	4500	4¾x6	36x6	40x12	W
Columbia	H	1½	1895	4 x5	35x5	38x7n	I
Columbia	G	2½	2335	4 x5¼	36x4	36x7	I
Comet	T	1½	1950	3¾x5	34x4	34x4	W
Commerce	T	¾-1½	1450	3¾x5	34x4½n	34x4½n	B
Commerce	12	1½	1800	3¾x5	35x5n	35x5n	I
Commerce	16	2	2150	3¾x5	35x5n	36x6	I
Commerce	18	2½	2495	4¼x5¼	36x6n	36x7n	I
Commerce	25	2½	2425	4½x5¼	36x4	36x7	W
Concord	A	2	3150	4 x5½	36x3½k	36x6k	W
Concord	B	3	3600	4¼x5½	36x4	36x8k	W
Concord	AX	2	3250	4 x5½	36x3½	36x6	W
Concord	BX	3	3600	4½x5½	36x4	36x8	W
Cook	51	2½	3600	4 x5⅝	36x6n	40x8n	W
Corbitt	E-22	1	1480	3¾x5	34x3½	34x4	W
Corbitt	D-22	1½	2200	3¾x5	34x3½	34x4	W
Corbitt	C-22	2	2600	4½x5¼	36x3½	36x6	W
Corbitt	B-22	2½	3000	4½x5¼	36x4	36x7	W
Corbitt	R-22	3	3200	4½x5½	36x4	36x8	W
Corbitt	A-22	3½-4	3800	4½x5½	36x5	36x10	W
Corbitt	AA-22	5	4500	4¾x6	36x6	40x6d	W
Day-Elder	AS	1	1600	3¾x5	35x5n	35x5n	W
Day-Elder	B	1½	2000	3¾x5	34x3½	34x5	W
Day-Elder	D	2	2400	4½x5¼	36x4	36x7	W
Day-Elder	C	2½	$2750	4¼x5½	36x4	36x7	W
Day-Elder	F	3½	3150	4½x5½	36x5	36x5d	W
Day-Elder	E	5	4250	4½x6	36x5k	40x6dk	W
Dearborn	E	1	1600	3⅝x5½	35x5n	35x5n	W
Dearborn	FX	1½	2300	3¾x5⅛	34x4	34x5	W
Dearborn	F	1½	2180	3¾x5⅛	34x4	34x5	W
Dearborn	48	2	2590	3¾x5⅛	34x4½n	34x7	W
Defiance	G	1	1695a	3¾x5	35x5n	35x5n	B
Defiance	D	1½	2095a	3¾x5	35x5n	36x6n	I
Defiance	E	2	2275a	3¾x5	35x5n	38x7n	I
Denby	31	1¼	1485	3½x5	35x5n	35x5n	B
Denby	33	1½	2145	3¾x5	35x5n	38x7n	I
Denby	34	2	2395	3¾x5	36x3½	36x6	I
Denby	35	2½-3	2795	4½x5¼	36x4	36x7	I
Denby	27	4	3895	4½x5½	36x5	36x5d	I
Denby	210	5	4295	4½x5½	36x6	40x6d	I
Dependable	A	¾-1	1650	3⅝x5½	34x5n	36x6n	W
Dependable	C	2	2350	3¾x5¼	34x3½	34x5	W
Dependable	D	2½	2650	4 x5½	34x5	36x6	W
Dependable	E	3	2950	4¼x5½	36x4	36x7	W
Diamond T	O-8	1-1¼	1975	3¾x5¼	36x3½n	36x4n	W
Diamond T	T	1½	2250	3¾x5¼	36x3½	36x5	W
Diamond T	U	2-2½	2650	4 x5¼	36x4	36x7	W
Diamond T	K	3½	3750	4½x5½	36x5	36x5d	W
Diamond T	EL	5	4325	4½x5½	36x6	40x6d	W
Diamond T	S	5	4500	4¾x6	36x6	40x6d	W
*Diehl		1	....	3½x5	34x4½	35x5	I
Diehl	B	1½	....	3½x5	36x6	36x6	I
Doane		2½	4100b	4¼x5¾	36x5	36x7	C
Doane		3½	5100b	4⅜x5¾	36x5	36x5d	C
Doane		6	6000b	5 x6¼	36x6	40x6d	C
*Dodge Brothers		½	730	3⅞x4½	32x4n	32x4n	B
Dorris	K-4	2-2½	3400	4¼x5½	36x4	36x7	W
Dorris	K-7	3½	4400	4¼x5½	36x5	36x10	W
*Dort	103	½	685a	3½x5	31x4n	31x4n	B
Double Drive	B	3	4000	4¼x5½	6	6	W
Duplex	A	2	2775	4 x5¼	35x5n	38x7n	W
Duplex	E	3½	3500	4¼x5½	36x8	36x8	I
Duty	22	2	1590	3½x5	34x3½	34x5	I
Eagle	101	1½	1875	3⅝x5½	34x5	34x5	I
Eagle	100-2	2	2275	3⅝x5¼	34x4k	34x7k	I
F. W. D.	B	3	4200	4⅜x5½	36x6	36x6	B
Fageol	1½	1½	3000	3⅝x5¼	34x3½k	34x6k	W
Fageol	2½	2½	3900	4¼x5¾	34x4	36x7	W
Fageol	3½	3½	5000	4½x6¼	36x5k	40x5dk	W
Fageol	5	5	5700	4½x6¼	36x8	40x6d	W
Fargo	R	2	1700	3⅝x5	36x4	36x6	I
Federal	SD	1½	1800	3⅝x5	35x5n	36x6n	W
Federal	TE	1½	2175	4½x5¼	36x3½	36x5	W
Federal	UE	2-2½	2425	4½x5¼	36x4	36x7	W
Federal	WE	3½-4	3150	4½x5½	36x5	36x5d	W
Federal	X2	5-6	4500	4⅜x6	36x6	40x6d	W
*Ford	TT	1	430	3¾x4	30x3½n	32x4½n	W
Front Drive	C	1½	2800	3⅜x5½	5	4	W
G & J**	20	1	2275	3⅝x5⅛	34x5n	34x5n	W
G & J**	A	2-2½	3375	4x5¼	36x4	36x7	W
G & J**	B	3½-4	4475	4½x5½	36x5	36x10	W
G.M.C.	K16	1	1295	3½x5½	34x5n	34x5n	B
G.M.C.	K-41A	2	2375	4 x5½	36x4k	36x7k	W
G.M.C.	K-41B	2	2375	4 x5½	36x4k	36x7k	W
G.M.C.	K-71A	3½	3600	4½x6	36x5	40x5d	W
G.M.C.	K-71B	3½	4050	4½x6	36x5	40x5d	W
G.M.C.	K-101A	5	3950	4½x6	36x5	40x6d	W
G.M.C.	K-101B	5	4450	4½x6	36x5	40x5d	W
G.W.W.		1½	1850	3⅜x5½	35x5	35x5	J
*Garford	15	¾	1590	3⅝x5½	34x5n	34x5n	W
Garford	25-B	1¼	1990	3⅜x5½	36x6n	36x6n	W
Garford	70-H	2	2750	4¼x5½	36x4	36x7	W
Garford	77-D	3½	3750	4½x6	36x5	36x6d	W
Garford	68D	5	4500	5 x6½	36x6	40x6d	W
Garford	150-A	7½	5200	5½x6	36x6	40x7d	C
Gary	F	1-1½	1675	3⅜x5	36x3½	36x4	W
Gary	I	2	2250	4 x5½	36x3½	36x6	W
Gary	J	2½	2650	4¼x5½	36x4	36x8	W
Gary	K	3½	3650	4½x6	36x5	40x5d	W
Gary	M	5	4100	5 x6½	36x6	40x6d	W
Gersix	M	1½	3100	4 x5½	36x3½	36x7	W
Gersix	K	2½	3500	4½x5½	36x4	36x8	W
Gersix		3½	4500	4½x6	36x5	40x12	W
Graham Bros.		1	1265	3⅞x4½	33x4½n	34x5n	B
Graham Bros.		1½	1325	3⅞x4½	33x4½n	36x6n	B
Gramm-Pion.	10	1	1365	3½x5	33x5n	33x5n	B
Gramm-Pion.	15	1½	1900a	3¾x5	36x3½k	36x5k	I
Gramm-Pion.	65	1½	2500a	3¾x5	36x3½k	36x5	W
Gramm-Pion.	20	2	2925a	4½x5¼	36x4k	36x7k	W
Gramm-Pion.	30	3	3275a	4¼x5½	36x4k	36x4dk	W
Gramm-Pion.	75P	3½	4225a	4½x5½	36x6n	42x9n	W
Gramm-Pion.	40	4	3995a	4½x5½	36x5	36x5dk	W
Gramm-Pion.	50	5-6	4895a	4¾x6	36x6	40x6dk	W
Hahn	B2	1	1700a	3½x5	34x5k	34x5k	W
Hahn	O	1½	1900	3¾x5¼	36x3½k	36x6k	W
Hahn	K	2	2275	4½x5½	36x7k	36x8k	W
Hahn	L	3	2900	4½x5½	36x5k	36x8k	W
Hahn	M	5	3500	4½x5½	36x5	36x10	W
Hahn	N	6	4500	4¾x6	36x6	40x12	W
Hal-Fur	E	1½	2350	4x5½	34x5n	38x7n	W
Hal-Fur	B	2½	3000	4¼x5½	36x6n	36x8	W
Hal-Fur	F	3½	$4000	4½x5½	36x6n	40x10	W
Hall	1½	1½	3100	3⅝x5	34x5n	38x7n	W
Hall	2½	2½	3275	4½x5¼	36x4	36x6	W
Hall	3½	3½	4100	4½x5½	36x5	36x5d	W
Hall	5	5	5100	4½x5½	36x5	40x6d	W
Hall	7 chain	7	5100	4½x5½	36x5	40x6d	C
Harvey	WOA	2	2650	4¼x5½	34x4	34x7	W
Harvey	WFA	2½	2950	4¼x5½	36x4	36x7	W
Harvey	WHA	3½	3950	4½x6	36x5	36x5d	W
Hawkeye	K	1½	1850	3¾x5½	34x3½k	34x5k	I
Hawkeye	M	2	2650	4¼x5	36x4k	36x6k	I
Hawkeye	N	3½	3700	4½x6⅜	36x5k	36x10k	I
Hendrickson	O	1½	2200	3¾x5½	36x4n	36x5n	W
Hendrickson	N	2½	2690	4¼x5¾	36x4k	36x7k	W
Hendrickson	M	3½	3000	4¼x5	36x5k	36x5dk	W
Hendrickson	K	5	4000	5 x6¼	36x6	40x6	W
Hurlburt	A	1½	2850	4 x5½	34x4	34x5	W
Hurlburt	B	2½	3750	4¼x5½	36x4	36x4d	W
Hurlburt	C	3½	4590	4½x6	36x5	36x5d	W
Hurlburt	D	5	5500	4½x6	36x5	40x6d	W
Indep'd't(Iowa)	B	1	1665	3½x5	34x3½	34x4	I
Indep'd't(Iowa)	G	1½	2040	3¾x5½	34x3½	34x5	I
Indep'd't(Ia.)	HI	2½	2940	4½x5¼	36x4	36x4	I
Indep'd't(Ohio)	F	1½	2385	3¾x5	36x3½	36x5	W
Indep'd't(Ohio)	H	2½	3085	4½x5¼	36x4	36x4d	W
Indep'd't(Ohio)	K	3½	3985	4½x5½	36x5	36x5d	W
Indiana	12	1½	....	3¾x5¼	34x3½k	34x5k	W
Indiana	20	2	....	4½x5¼	36x4k	36x7k	W
Indiana	25	2½	....	4½x5½	36x4k	36x8k	W
Indiana	35	3½	....	4⅜x5½	36x5k	36x5dk	W
Indiana	51	5	....	5 x6¼	36x5k	40x6dk	W
*International	S	¾	1500	3½x5	34x5n	34x5n	I
International	21	1	1750	3½x5¼	36x3½	36x3½	I
International	31	1½	1850	3½x5¼	36x3½	36x4	I
International	41	2	2100	3½x5¼	36x3½	36x5	I
International	61	3	2400	4¼x5	36x4	36x6	I
International	101	5	3600	4¼x5	36x5	40x10	I
Jackson	4WD	3½	3850	4½x5½	36x7	36x7	B
Jumbo	15	1½	2295	3¾x5¼	36x3½	36x5	I
Jumbo	20	2	2520	3¾x5¼	35x5n	38x7n	I
Jumbo	25	2½	2660	4½x5½	36x4	36x7	I
Jumbo	30	3	3060	4¼x5½	36x6n	42x9n	I
Jumbo	35	3½	3900	4½x6	36x5	36x10n	I
Jumbo	40	4	4400	4½x6	38x7n	44x10	I
K-Z	1	1	1750	3½x5	34x3½	34x5	W
K-Z	1½	1½	2075	3¾x5	36x4	36x6	W
K-Z	2	2½	2550	4½x5¼	36x4	36x8	W
K-Z	3½	3½	3350	4½x5½	36x5	40x10	W
K-Z	5	5	3850	4½x5½	36x6	40x6d	W
Kalamazoo	T	1	1295	4 x5	34x5	34x5n	B
Kalamazoo	G-1	1½	2495	3¾x5	34x4	34x5	W
Kalamazoo	LG	2	2645	4 x5	36x4	36x7	W
Kalamazoo	NH	3	3145	4 x6	36x5	36x10	W
Kalamazoo	HD	3	3350	4½x6	36x5	36x10	W
Kalamazoo	LK	4	3845	4½x6	36x5	36x12	W
Kalamazoo	OK	5	4350	4½x6	36x6	40x6d	W
*Kearns	H	1	1150	3½x5	32x4½n	32x4½n	I
Kearns	N	2	1650	4 x5	34x3½	34x6	I
*Kelly-S	K-31	1½	2700	3¾x5¼	36x3½	36x6	C
*Kelly-S	K-34	1½	2700	3¾x5¼	36x3½	36x6	W
*Kelly-S	K-38	2½	2900	3¾x5¼	36x4	36x4d	W
*Kelly-S	K-35	2½	2900	3¾x5¼	36x4	36x4d	C
*Kelly-S	K-40	3½	3900	4½x6½	36x5	40x5d	C
*Kelly-S	K-41	3½	3900	4½x6½	36x5	36x10	I
*Kelly-S	K-42	3½	3900	4½x6½	36x5	40x5d	W
*Kelly-S	K-50	5	4400	4½x6½	36x6	40x6d	C
*Kelly-S	K-60	6	4500	4½x6½	36x6	40x7d	C
Keystone	40	2	2175	3¾x5⅛	34x5n	38x7n	I
Kimball	AB	2	3675	4 x6	36x4	36x7	W
Kimball	AC	2½	3975	4¼x6	36x4	36x8	W
Kimball	AK	3	4500	4½x6	36x4	36x10	W
Kimball	AE	4	5000	4¾x6	36x5	40x12	W
Kimball	AF	5	5500	5 x6	36x6	40x7d	W
*Kissel	Express	1	1595	3¾x5½	34x5n	34x5n	W
Kissel	Utility	1½	1975	3¾x5½	36x3½	36x5	W
Kissel	Freighter	2½	2875	4¼x5½	36x4	36x7	W
Kissel	H. D.	4	3675	4¼x5½	36x5	36x5d	W
Kleiber	AA	1	2200	4¼x5¼	34x3½k	34x5k	W
Kleiber	A	1½	3100	4½x5¼	36x3½k	36x6k	W
Kleiber	BB	2	3600	4½x5¼	36x4k	36x7k	W
Kleiber	B	2½	3950	4½x5½	36x5k	36x8	W
Kleiber	C	3½	4600	4½x5½	36x5	36x5d	W
Kleiber	D	5	5300	5 x6½	36x6	40x12	W
Koehler	D	1½	1995	3½x5	34x3½	34x5	W
Koehler	M	2½	3175	4 x5½	36x4	36x7	W
Koehler	MCS	2½	3275	4 x5½	36x4	36x7	W
Koehler	F	3½	4150	4½x5½	36x5	36x10	W
Koehler.MT.	Trac	5	3275	4 x5½	36x4	36x7	W
Krebs-Collier	23	¾	1260	3¾x5	34x4½	34x4½	B
Krebs-Collier	24	1	1565	3¾x5	34x5	34x5	W
Krebs-Collier	45	1½	2125	4¼x5¼	36x4	36x7	W
Krebs-Collier	75	2½	2375	4½x5½	36x4	36x8	W
Krebs-Collier	110	3½	2975	4½x5½	36x5	40x10	W
Larrabee	X-2	1	1925	3½x4½	34x5n	34x5n	B
Larrabee	U	1½	2400	3¾x5	34x3½	34x5	W
Larrabee	J	1½-2½	2400	3¾x5	34x3½k	34x5k	W
Larrabee	K	2½	3100	4¼x5¼	36x4	36x7	W
Larrabee	K-5	2½-3	3450	4½x5½	36x4	36x8	W
Larrabee	L-4	3½	4000	4½x5½	36x5	36x5d	W
Larrabee	W	5	4800	4½x6	36x6	40x6d	W
Maccar	L	1½	2700	4¼x5¼	36x4	36x6	W
Maccar	H-A	2	3400	4½x5¼	36x4	36x4d	W
Maccar	H-2	3	3400	4½x5½	36x4	36x5d	W
Maccar	H-3	4	4200	4½x5½	36x5	36x6d	W
Maccar	G	5-6	4950	4¾x6	36x5	40x6d	W
MacDonald	A	7½	5750	4½x6	40x7	40x14	I

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
t—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—speed truck or delivery wagon. **—Canadian Make. trac.—tractor.

†1—Gramm-Pioneer. 2—Kelly-Springfield.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Mack...AB D.R.	1½	$3450	4 x5	36x4	36x3½d	D
Mack...AB Chain	1½	3000	4 x5	36x4	36x3½d	C
Mack...AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack...AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack...AB D.R.	2½	3850	4 x5	36x4	36x4d	D
Mack...AB Chain	2½	3400	4 x5	36x4	36x4d	C
Mack...AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack...AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack...AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack...AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac...AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac...AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac...AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac...AC	13	5750	5 x6	36x6	40x12	C
Mack Trac...AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf...AA**	2	3775	4 x5½	36x4	36x7	W
Mapleleaf...BB**	3	4350	4¼x5½	36x4	36x4d	W
Mapleleaf...CC**	4	5100	4½x5½	36x5	36x5d	W
Mapleleaf...DD**	5	6200	4½x5½	36x6	40x6d	W
Master.....JW	1½	2290	4½x5½	34x3½	34x5	W
Master.....JD	1½	2590	4½x5½	34x3½	34x5	D
Master.....Z	2	2290	4½x5½	34x3½	34x5	W
Master.....W	2½	2890	4¼x5½	34x4	36x7	W
Master.....DD	2½	3190	4¼x5½	34x4	36x7	D
Master.....A	3½	3990	4½x6	36x5	40x5d	W
Master.....E	3½	4290	4½x6	36x5	40x5d	D
Master.....Y	4	4490	4½x6	36x5	40x6d	D
Master.....B	5	4990	4¾x6½	36x6	40x6d	W
Master.....F	5	5090	4¾x6½	36x6	40x6d	D
MasterTrac.,DDT	6	3390	4¼x5½	34x4	36x7	D
*Maxwell.....1½	1½	932	3⅝x4½	32x3n	32x4n	W
Menominee...HT	1–1¼	2000	3¾x5	34x3½	36x5	W
Menominee....H	1½	2475	4 x5	36x3½	36x5	W
Menominee....D	2–2½	2875	4 x6	36x4	36x8	W
Menominee....G	3½	3800	4½x6	36x5	36x10	W
Menominee...J-3	5	4250	4¾x6	36x6	40x12	W
Moline.....10	1½	1985	3½x5	34x5n	36x6n	I
³Moreland..R. R.	1	1595	4 x5	34x5n	34x5n	B
Moreland.....BX	1½	1980	4 x5	36x3½	36x6k	W
Moreland.....EX	2	2800	4½x5½	36x4	36x7k	W
Moreland.....AX	3	3500	4½x5½	36x5	36x10k	W
Moreland.....RX	4½–5	4600	4¼x6	36x6	40x6	W
Napoleon.....7	¾	1350	3½x5	33x4	33x4n	I
Napoleon.....9	1	1535	3½x5	35x5k	35x5k	I
Napoleon.....11	1½	1860	3½x5	35x5k	36x6k	I
Nash.....2018	1–1½	1595	3¾x5¼	35x5	36x6	I
Nash.....3018	2–2½	2150	3¾x5¼	36x6	40x8	I
Nash.....Quad.	2–2½	2750	4¼x5½	40x8	40x8	I
Nash..3018, LWB	2–2½	2200	3¾x5¾	36x6	40x8	I
Nash..Quad. LWB	2–2½	2800	4¼x5½	40x8	40x8	I
Nash.....5018	2½	2250	3¾x5¼	34x4	34x6	I
⁴Nelson.....G2	1½	....	4½x5¼	36x3½	36x6	W
⁴Nelson.....G3	2½	....	4½x5¼	36x4	36x7	W
⁴Nelson.....G4	3½	....	4½x5½	36x5	36x5d	W
⁴Nelson.....G5	5	....	4¾x6	36x6	40x6d	W
Netco.....DK	2	3100	4½x5¼	36x4k	36x7k	W
Netco.....HL	2½	3500	4½x5½	36x4k	36x8k	W
New York.....M	1½	....	4½x5¼	36x3½	36x5	W
New York.....N	2–2½	....	4½x5¼	36x4	36x4d	W
Niles.....E	2	3000	4½x5¼	36x4k	36x7k	W
Noble.....B30	1½	....	3¾x5¼	36x3½	36x5	W
Noble.....C40	2	....	4 x5½	36x4	36x7	W
Noble.....D50	2½	....	4¼x5½	36x4	36x8	W
Noble.....E70	3½	....	4½x6	36x5	36x10	W
Northwestern..W	1½	2700	4½x5¼	34x4	36x6	W
Northwestern..WS	2½	3500	4½x5½	36x4	36x8	W
Norwalk.....25E	1	1595	3½x5	34x3½	34x4	W
Norwalk.....35E	1½	1925	3½x5	34x3½	34x3½d	W
Norwalk,35E.Spec	1½	2285	3¾x5¼	34x3½	34x5	W
O. K.....K1	1½	2450	4 x5½	36x3½	36x5	W
O. K.....L1	2½	3250	4¼x5½	36x4	36x8	W
O. K.....M1	3½	4250	4½x6	36x5	36x5d	W
Ogden.....D	½	....	3⅜x5	36x3½	36x5	W
Ogden.....D	1½	....	3¾x5	36x3½	36x5	W
Ogden.....E	2½	....	4½x5¼	36x4	36x8	W
Old Hickory...W	1	1775	3¾x5	36x3½k	36x4k	W
Old Reliable...A	1½	2350	4 x5	34x4	36x6	W
Old Reliable...B	2½	3500	4¼x6	34x4	36x4d	W
Old Reliable....C	3½	4250	4½x6	36x5	36x5d	W
Old Reliable....D	5	5250	4¾x6	36x6	40x6d	W
Old ReliableKLM	7	6000	4¾x6½	36x6	40x7d	C
*Oldsmobile Econ	1	1095	3½x5¼	35x5n	35x5n	I
Olympic.....A	2½	3200	4¼x5½	36x4	36x8	W
Oshkosh.....A	2	3250	3½x5	36x6n	36x6n	B
Oshkosh.....AA	2	3400	3½x5	36x6n	36x6n	B
Oshkosh.....B	2½	3850	4 x5½	38x7n	38x7n	B
Oshkosh.....BB	2½	4000	4 x5½	38x7n	38x7n	B
*Overland.....4	½	450	3⅝x4	30x3½n	30x3½n	B
Packard.....EC	1½–3	3100	4¼x5½	36x4	36x7	W
Packard.....EX	1½–3	3100	4¼x5½	36x6n	40x8n	W
Packard.....ED	2–4½	4100	4½x5½	36x5	36x5d	W
Packard.....EF	4–7½	4500	5 x5½	36x6	40x6d	W
Paige.....52-19	1½	1950	4 x5¼	34x3½	34x5	W
Paige.....54-20	2½	2420	4¼x5½	34x4	34x8	W
Paige.....51-13	3½	3115	4½x5½	36x5	36x5d	W
Parker.....C-22	1	1875	3¾x5¼	34x5n	34x5n	W
Parker.....G-22	2½	3200	4¼x6	34x4	36x4d	W
Parker.....J-20	3½	3950	4½x6	36x5	40x5d	W
Parker.....M-20	5	4850	5 x6	36x6	40x6d	W
Patriot... Revere	1	1380	3¾x5	35x5n	35x5n	W
Patriot... Lincoln	2	2050	4 x5½	34x3½	34x5	W
Patriot .Washgt'n	3	2900	4½x5½	36x4	36x7	W
Pierce-Arrow....	2	3200	4 x5½	36x4	36x4d	W
Pierce-Arrow....	3½	4350	4½x6¾	36x5	36x5d	W
Pierce-Arrow....	5	4850	4½x6¾	36x5	40x6d	W
Pittsburgher.....	1½–2	3000	3⅝x5	36x4	36x6	..
Pittsburgher.....	3	$3800	4½x5¼	36x5k	36x8	W
Power.....F	2	3150	3¾x5¼	36x5	36x7	W
Power.....C	3½	4250	4¼x5½	36x5	40x10	W
*Rainier.....R-21	¾	....	3½x5	35x5n	35x5n	W
Rainier.....R-29	1	....	3¾x5	34x3½	34x4	W
Rainier.....R-26	1½	....	3¾x5	34x3½	34x5	W
Rainier.....R-28	2	....	4½x5¼	34x4	34x6	W
Rainier.....R-20	2½–3	....	4½x5¼	34x4	34x7	W
Rainier.....R-15	3½–5	....	4½x5½	36x5	36x5d	W
Rainier.....R-17	5–6	....	4¾x6	36x6	40x6d	W
Ranger..TK-22-2	1½	2450	3¾x5	36x6n	38x7n	W
*Reo.....F	¾–1¼	1245	4½x4½	34x4½n	34x4½n	B
Reliance.....10A	1½	2400	4 x5½	36x3½	36x5	I
Reliance.....20B	2½	3100	4¼x5½	36x4	36x4d	I
Republic.....75	¾	1395b	3½x5	32x4½n	32x4½n	I
Republic.....10	1	1395	3¾x5	34x3	34x4	I
Republic..10 Exp	1	1695	3¾x5	35x5n	34x5n	I
Republic.....11X	1½	1795	3¾x5	34x3½	34x6	I
Republic.....19	2½	2195	4½x5¼	36x4	36x7	I
Republic.....20	3½	3095	4½x5½	36x5	36x10	I
Rowe.....CW	1½	3000	3¾x5	36x6n	36x6n	W
Rowe....C.D.W.	2	3300	4 x5	34x4	36x3½d	W
Rowe....G.S.W.	3	4150	4 x6	34x5	36x5d	W
Rowe....G.P.W.	3	5250	3¼x5r	38x7n	42x9n	W
Rowe.....HW	4	4500	4¼x6	36x5	36x6d	W
Rowe.....F. W.	5	5500	4½x6	36x6	40x6d	W
Ruggles.....20	1	1195	3¾x5	34x5n	34x5n	B
Ruggles.....40	2	1795	4 x5	34x5n	34x7	D
Sanford....W-15	1½	2150b	3¾x5	36x3½k	36x5k	..
Sanford.....25	2½	....	4½x5¼	36x4	36x4d	W
Sanford.....35	3½	....	4½x5½	36x5	36x5d	W
Sanford.....50	5	....	4¾x6	36x5	40x6d	W
Schacht....2-Ton	2	3200	4¼x5½	36x4	36x7	W
Schacht....3-Ton	3	3800	4¼x5½	36x5	36x5d	W
Schacht....4-Ton	4	4200	4½x6	36x5	40x5d	W
Schacht....5-Ton	5	4400	4½x6	36x5	40x6d	W
Schacht....7-Ton	7	5050	4½x6	36x6	40x7d	W
Schwartz.....A	1	1685	3½x5	34x4½n	34x4½n	B
Schwartz.....K	2	3000	3¾x5¼	34x3½	34x7	W
Schwartz.....M	5	4900	4½x6	36x6	40x12	W
Selden.....30	1½	2250	3¾x5	34x3½	34x5	W
Selden.....31	1½–2½	3350	4½x5¼	34x5	38x7	W
Selden.....50	2½	3250	4½x5½	36x4	36x7	W
Selden.....51	2½–3½	4350	4½x5½	36x6n	40x8n	W
Selden.....70	3½–5	3750	4½x5½	36x5	36x10	W
Selden.....90	5–7	4950	4¾x6	36x6	40x12	W
Seneca.....M	½	820	3½x4½	30x3½n	30x3½n	B
*Service.....12	¾	....	3¼x4½	32x4½n	32x4½n	B
*Service.....15	1¼	....	3⅝x5	34x4½n	35x5n	B
Service.....21	1½	....	3½x5½	34x3½	34x5	W
Service.....32	2	....	4 x5½	36x3½	36x7	W
Service.....37	2	....	4¼x5½	35x5n	38x7n	W
Service.....52	3	....	4¼x5½	36x4	36x8	W
Service.....72	3½	....	4¼x5½	36x5	36x5d	W
Service.....77	4	....	4½x6	36x5	36x5d	W
Service.....102	6	....	4½x6	36x6	40x6d	W
Signal.....NF	1	1950	3¾x5	34x5n	36x6n	W
Signal.....H	1½	2450	4½x5¼	34x4	36x6	W
Signal.....J	2½	2875	4½x5¼	34x4	36x8	W
Signal.....M	3½	3675	4½x5½	36x5	40x5d	W
Signal.....R	5	4400	4¾x6	36x6	40x6d	W
Southern.....10	1	2090	3¾x5	34x3½	34x4	W
Southern.....15	1½	2590	3¾x5½	36x6n	34x4	W
Southern.....20	2	2990	4¾x5¼	36x6n	40x8k	W
Standard.....1-K	1½	1600	3¾x5	34x3½k	34x5k	W
Standard.....76	2½–3	2400	4½x5¼	36x4k	36x7k	W
Standard.....66	3½–5	3150	4½x5½	36x5	36x10	W
Standard.....5-K	5–7	4400	4¾x6	36x6	40x12	W
Sterling.....1½	1½	2885	4 x5¾	36x3½k	36x5k	W
Sterling.....2	2	3085	4 x5½	36x4k	36x6k	W
Sterling.....2½	2½	3290	4⅜x5¾	36x4k	36x4dk	W
Sterling.....3½	3½	4325	4½x6¼	36x5k	40x5dk	W
Sterling.....5-W	5	4950	5 x6¼	36x6	40x6d	W
Sterling.....5-C	5	5500	5 x6¼	36x6	40x6d	C
Sterling.....7½	7½	6000	5 x6¼	36x6	40x7d	C
*Stewart.....1A	½–1½	1245	3⅝x5½	34x4½n	34x4½n	I
Stewart.....15	1½–1½	1445	3⅝x5½	35x5n	35x5n	I
Stewart.....9	1½–2	1790	3¾x5	34x3½	34x5	I
Stewart.....7	2–2½	2190	4¼x5½	34x4	34x7	I
Stewart.....7-X	2½–3	2390	4¼x5½	34x4	34x7	I
Stewart.....10	3½–4	3190	4½x5½	36x5	36x5d	I
Stewart.....10-X	3½–4	3190	4½x6	36x5	36x5d	I
*Stoughton.....C	¾	1240	3½x5	34x4½n	34x4½n	W
Stoughton.....A	1	1790	3¾x5¼	34x5	34x5	W
Stoughton.....B	1½	2150	3¾x5¼	36x3½	36x5	W
Stoughton.....D	2	2490	4 x5½	36x4	36x7	W
Stoughton.....F	3	3150	4¼x5½	36x5d	36x5d	W
Sullivan.....E	2	2800	4¼x5½	36x4k	36x7k	W
Sullivan.....H	3½	3750	4½x6	36x5	36x5d	W
*Thomart.....	1¼	1795a	4 x5¼	34x5	34x5	C
Tiffin.....GW	1½	2100	4¼x5¼	36x3½	36x5	W
Tiffin.....MW	2½	2700	4½x5¼	36x4	36x3½d	W
Tiffin.....PW	3½	3600	4½x5½	36x5	40x5d	W
Tiffin.....F50	5	4300	4¾x6	36x6	40x6d	W
Tiffin.....F60	6	4500	4¾x6	36x6	40x12	W
Titan.....	2	$2950	4x5½	34x4k	36x7	I
Titan.....	3½	3950	4¼x5½	36x5	40x10	I
Titan.....	5	4550	4½x6	36x5	40x6d	I
Titan.....6-Ton	6	5150	4½x6	36x5	40x12	I
Tower.....J	1½	2900	4⅛x5¼	35x5	38x7	W
Tower.....H	2½	3200	4⅛x5¼	36x4	36x7	W
Tower.....G	3½	4100	4½x5½	36x5	36x5d	W
Traffic.....	1½	1595	3¾x5	35x5n	35x5n	I
Traffic.....C	2	1595	3¾x5	34x3½k	34x5k	I
Traffic.....	3	1895	3¾x5	36x4	36x7	I
*Transport.....15	1	1295a	3¾x5	32x4½n	32x4½n	B
Transport.....25	1½	1495	3¾x5½	34x3½k	34x4k	I
Transport.....35	2	1885	3¾x5	36x3½k	36x6k	I
Transport.....55	3	2385	4¼x5¼	36x4k	36x8k	I
Transport.....60	3½	2585	4¼x5½	36x4k	36x8k	I
Transport.....75	5	3485	4½x6	36x5k	36x12k	I
Traylor.....B	1½	2390	3¾x5⅛	34x3½	34x5	W
Traylor.....C	2–2½	2850	4 x5½	36x4	36x7	W
Traylor.....D	3–3½	3300	4¼x5½	36x4	36x8k	W
Traylor.....F	5–6	4700	4½x6	36x6	40x6d	W
*Triangle.....AA	1	1285	3¼x5	34x4½n	34x4½n	I
Triangle.....A	1½–2	1985	3¾x5¼	34x3½k	34x6k	I
Triangle.....C	2–2½	2285	3¾x5¼	36x4k	36x6k	I
Triangle.....B	2½–3	2585	4 x5⅜	36x4k	36x7k	I
Triumph.....G	1	1995	3⅝x5½	34x5n	34x5n	W
Triumph.....HC	1½	2550	3¾x5¼	36x3½	36x5	W
Triumph.....HB	2	2900	3¾x5¼	36x4	36x7	W
Twin City...B.W.	2	2750	4 x5½	36x6	40x8	I
Twin City...A.W.	3½	3950	4¼x6	36x5	40x5d	W
⁵Twin City.....B	3½	....	5½x6	36x6	36x6	I
⁵Twin City.....A	5	....	5½x6	36x7	36x7	I
Ultimate.....A	2	3150	4 x5½	36x3½	36x6	W
Ultimate.....AJ	2	3200	4¼x5½	36x3½	36x6	W
Ultimate.....AJL	2	3250	4¼x5½	36x3½	36x6	W
Ultimate.....B	3	3700	4¼x5½	36x4	36x4d	W
Ultimate.....BL	3	3800	4¼x5½	36x4	36x4d	W
Ultimate.....D	5	5500	5 x6½	36x6	40x12	W
Union.....FW	2½	3490	4 x6	36x5k	36x8k	D
Union.....HW	4	4650	4½x6	36x6	40x12	D
Union.....JW	6	5800	5 x6	36x6	40x14	D
United.....A	1½	2445	3¾x5¼	36x3½k	34x5k	W
United.....B	2½	3150	4¼x5½	36x4k	36x7k	W
United.....C	3½	3975	4¼x5½	36x5	36x5d	W
United.....V	5	4500	4½x6	36x6	40x6d	W
*United States..U	1	1875	3⅝x5⅛	34x5n	34x5n	B
UnitedStates,NW	1½	2225	3¾x5	36x5	36x3½	W
United States...N	1½	1975	3¾x5	36x3½k	36x5k	I
United States...R	3	3075	4 x5¼	36x4	36x4d	W
United States...S	4	3875	4½x5½	36x5	36x5d	W
United States...T	6	4850	4¾x6½	36x6	40x6d	W
Velie.....46	1½	1585	3¾x5	36x3½k	36x5k	I
Veteran.....M**	1½	2699	3¾x5¼	35x5n	35x5n	W
Veteran.....P**	2	3699	4¼x5½	36x4	36x7	W
Veteran.....R**	3	4200	4¼x5½	36x4	36x7	W
Veteran.....S**	4	5395	4½x6	36x5	36x10	W
*Vim.....29	½	1050	3½x4½	31x4n	31x4n	W
Vim.....30	½	1175	3½x4½	32x4½	32x4½	W
Vim.....31	1	1975	3¾x5⅛	35x5n	35x5n	W
Vim.....22	2	3150	3¾x5⅛	36x4	36x6	W
Vim.....23	3	3950	4¼x5½	36x5	36x5-1	W
Walker-JohnsonA	2	2250	3¾x5	34x3½	34x6	W
Walker-JohnsonB	3	2750	4¼x5½	36x4	36x8	W
Walter.....S	5	4850	4½x6½	36x6	40x6d	W
Ward-LaF.....2B	2½	2990	4⅜x5¾	36x4	36x4d	W
Ward-LaF.....4A	3½	3990	4½x6½	36x5	36x5d	W
Ward-LaF.....5A	5	4590	5 x6½	36x6	40x6d	W
*Watson.....B	1	1865a	3¾x5¼	35x5n	35x5n	W
Watson.....N	3½	4250	4½x5½	36x5	36x10	W
Western....W1½	1½	2550	4⅛x5¼	36x3½k	36x5k	W
Western....L1½	1½	2550	3¾x5	36x3½k	36x5k	W
Western....W2½	2½	3250	4⅛x5¼	36x4	36x7	W
Western....L2½	2½	3250	4¼x6	36x4	36x7	W
Western....W3½	3½	4250	4½x6	36x5	40x5d	W
*White.....15	¾	2400	3¾x5½	34x5n	34x5n	B
White.....20	2	3250	3¾x5½	36x4k	36x7	D
White.....40	3½	4200	3¾x5¾	36x5	40x5d	D
White.....45	5	4500	4¼x5¾	36x6	40x6d	D
White Hick.....E	1	1225	3¾x5	34x5n	34x5n	W
White Hick.....H	1½	1375	3¾x5	36x3½	36x5	W
White Hick.....K	2½	1675	4⅛x5¼	36x4	36x5	W
Wichita.....K	1	1875	3¾x5¼	36x3½	36x4k	W
Wichita.....M	2	2400	3¾x5¼	36x3½k	36x6k	W
Wichita.....RX	3	3200	4⅜x5¾	36x4k	36x8k	W
Wichita.....O	4	3500	4½x6¼	36x5k	36x5k	W
Wilcox.....AA	1	1900	3¾x5½	36x4k	36x4k	W
Wilcox.....BB	1½	2550	4¼x5	36x4	36x5	W
Wilcox.....D	2½	3000	4¼x5	36x4k	36x3½dk	W
Wilcox.....E	3½	3950	4½x6	36x5k	36x5dk	W
Wilcox.....F	5	4350	4¾x6½	36x5	40x6d	W
Wilson.....F	1½	2270	3¾x5	36x3½	36x5	W
Wilson.....EA	2½	2825	4⅛x5¼	36x4	36x7	W
Wilson.....G	3½	3685	4½x5½	36x5	36x5	W
Wilson.....H	5	4520	4¾x6	36x6	40x6	W
*Wisconsin.....A	1	1750	3¾x5	34x5n	34x5n	W,B
Wisconsin.....B	1½	2100	3¾x5	35x5	36x6	W
Wisconsin.....C	2½	2700	4 x5¾	36x6n	36x7	W
Wisconsin.....D	3½	3000	4⅜x5¾	36x6n	40x8	W
Wisconsin.....E	5	3500	4½x6¼	36x6	36x10	W
Wisconsin.....F	7	4000	5 x6¼	36x6	36x12	W
Witt-Will.....N	1½	2250	3¾x5	36x3½k	36x5k	W
Witt-Will.....P	2½	2750	4½x5¼	36x3½k	36x7k	W
Wolverine.....J	1	2125	3½x5	34x3	34x4	I
Wolverine.....J	1½	2375	3¾x5	34x3½	34x5	I
Wolverine.....J	2	2610	3¾x5	34x4	34x7	I
Wolverine.....J	2½	3425	4½x5¼	36x5	36x10	I
Wolverine.....L	3½	4100	4½x5½	36x5	36x10	I

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—speed truck or delivery wagon. **—Canadian Make. trac.—tractor.

3—Moreland Road Runner. 4—Nelson Le Moon. 5—Twin City Four Wheel Drive.

Specifications of Current Farm Tractor Models

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
Allis-Chal.G.P	6-12	$250	2	LeR.	4-3½x4½	Gas.	1
Allis-Chalm..B	6-12	325	2	LeR.	4-3½x4½	G	1
Allis-Chalm...	15-25	1185	4	Midw.	4-4½x5¼	Gas.	3
Allis-Chalm...	20 35	1885	4	Own	4-4¾x6½	GorK	3-4
‡Allis-Chalm.	20-35	2085	4	Own	4-4¾x6½	G	4
Allwork...2-G	14-28	1695	4	Own	4-4¾x6	GorK	3
Allwork.....C	14-28	1395	4	Own	4-5 x6	GorK	3
AndrewsKin.D	18-36	2500	4	Clim.	4-5 x6½	GorK	4
ARO..1921-22	3-6	385	4	Own	1-4½x5	Gas.	1
Aultman-T....	15-30	2200	4	Clim.	4-5 x6½	G,K	4
Aultman-T....	22-45	3420	4	Own	4-5½x8	G,K	6
Aultman-T....	30-60	4500	4	Own	4-7 x9	G,K,D	8-10
Automot. B-3	12-21	1250	4	Herc.	4-4 x5½	Gas.	2-3
Avery,SR.Cul	5-10	....	4	Own	4-3 x4	G,K	..
Avery..Cult-C	....	....	3	Own	6-3 x4	G,K	..
Avery.....B	5-10	....	4	Own	4-3 x4	G,K	2
Avery.....C	....	....	4	Own	6-3 x4	G,K	..
Avery.....	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery.....	12-20	....	4	Own	4-4½x6	G,K,D	3-4
Avery.....		....	*	Own	4-4x5½	G,K,D	3
§Avery.....	....	....		Own	4-4x5½	G,K,D	3
Avery.....	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery.....	14-28	....	4	Own	4-4½	G,K,D	3-4
Avery.....	18-36	....	4	Own	4-5½x6	G,K,D	4-5
Avery.....	25-50	....	4	Own	4-6½x7	G,K,D	5-6
Avery.....	45-65	....	4	Own	4-7¾x8	G,K,D	8-10
Bates Mule .H	15-25	....	4	Midw	4-4½x5¼	Gas.	3
Bates Mule..F	18-25	....	*2	Midw	4-4½x5¼	Gas.	3
‡Bates MuleG	25-35	....	*2	Midw	4-4½x6	Gas.	..
Beeman,....G	2-4	240	4	Own	1-3½x4½	Gas.	..
Best.....	18-30	3100	*2	Own	4-4¾x6½	G,K,D	4
Best.....	60	5450	*2	Own	4-6½x8½	G,K,D	8-9
Boring...1921	....	1850	3	Wauk	4-4¾x5¾	GorK	2
Burn-Oil, 1922	15-30	1435	4	Own	2-6¾x7	Ker.	3-4
Capital.....	15-30	1000	2	Own	4-4¾x6	Gas.	3
Case.....	10-18	700	4	Own	4-3½x5	GorK	2
Case.....	12-20	1050	4	Own	4-4½x5	G,K,D	3
Case.....	15-27	1320	4	Own	4-4½x6	GorK	3-4
Case.....	22-40	2550	4	Own	4-5½x6¾	GorK	4-5
Case....40-72	40-72	5200	4	Own	7 x8	G,K,D	8-10
Caterpillar .5T	25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar 10T	40	....	*2	Own	4-6½x7	Gas.	6
Caterpillar T35	15-25	....	2	Own	4-4 x5½	Gas.	3
Centaur.....	5-2½	345	2	N Way	2-4½x4½	GorK	1
Chicago....40	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac.....F	9-16	595	*2	Own	4-3¼x4½	G,K,D	2
Cletrac.....W	12-20	1345	*2	Own	4-4 x5½	G,K,D	2-3
Dakota.....4	15-27	1500	3	Dom,	4-4¾x6	Gas.	3
Depue.....A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill.....D	20	2380	4	Cont.	4-4½x5½	Gas.	3
Dill.....R.W.	20	2980	4	Midw.	4-4½x6	Gas.	3
Do-it-All....A	3-6	495	..	Own	1-4½x5	Gas.	1
Eagle.....F	12-22	....	4	Own	2-7 x8	GorK	3-4
Eagle.....H	16-30	....	4	Own	2-8 x8	G or K	4-5
E-B.....AA	12-20	1095	4	Own	4-4¾x5	G,K,D	3
E-B.....Q	12-20	750	4	Own	4-4¾x5	G,K,D	3
E-B.....	16-32	1750	4	Own	4-5¼x7	G,K,D	4
Fageol.....D	9-18	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse..B	18-30	1885	4	Clim.	4-5 x6½	G,K	4
Farquhar.	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar.....	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar.....	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch..4 Drive	20-35	1850	4	Clim.	4-5 x6½	GorK	3-4
Fordson.....	-18	$ 395	4	Own	4-4x5	G,K	2
Fox.....E	20-40	2390	4	Own	4-5½x7½	G or K	4
Franklin....G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-4
Franklin....C	18-30	3350	*2	Clim.	4-5 x6½	G or K	3-4
Franklin...G2	18-30	4350	2	Clim.	4-5 x6½	G or K	3-4
Frick.....A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick.....C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Grain Belt...A	18-36	2150	4	Wauk.	4-4¾x6¾	G or K	4
Gray.....1920	18-36	....	3	Wauk	4-4¾x6¾	Gas,	4
Gt. Western St	20-30	1950	4	Beav.	4-4¾x6	K	4
Hart-Parr..20	20	945	4	Own	2-5¼x6½	K,D.	2
Hart-Parr..30	30	1295	4	Own	2-6½x7	K,D.	3
‡Hart-Parr....	....	1695	4	Own	6½x7	K.D.	..
Heider.....D	9-16	870	4	Wauk	4-4¼x5¾	G,K	2
Heider.....C	12-20	995	4	Wauk	4-4½x6¾	G,K	3
Heider....Cult	5-10	800	4	LeR.	4-3½x4½	Gas.	1
Huber Light 4.	12-25	1185	4	Wauk	4-4½x5¾	G or K	3
Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas	3
Illinois.....C	15-30	....	4	Clim.	4-5 x6½	G,K	4
Imperial... E	40-70	4500	4	Own	4-7½x9	G,K,D	10
Indiana.....F	5-10	665	2	LeR.	4-3½x4½	Gas.	1-2
Internatl.Titan	8-16	†670	4	Own	4-4¼x5	G,K,D	2
Internatl.Titan	10-20	†700	4	Own	2-6½x8	G,K,D	3
International..	15-30	1750	4	Own	4-5¼x8	G,K,D	4
J-T.....N	20-40	....	*2	Clim.	4-5x6½	G,K,D	3-4
Lauson.....5	12-25	1495	4	Midw.	4-4½x5¼	Gas.	3
Lauson.....20	15-25	1495	4	Beav.	4-4½x6	G or K	3-4
Lauson.....21	15-30	1875	4	Beav.	4-4¾x6	G or K	3-4
‡Lauson Road	15-30	2100	4	Beav.	4-4¾x6	K	..
Leader.....B	12-18	685	4	Own	2-6 x6½	G,K,D	2-3
Leader.....N	16-32	1725	4	Clim.	4-5 x6½	G,K	3-4
‡Leader...GU	18-35	2150	*2	Clim.	4-5 x6½	G,K	3-4
Linn.....H4J	40-	4500	*	Cont.	4-4½x5½	Gas	4
Linn.....W	60	5000	*	Wauk	4-5 x6½	Gas	6
Little Giant..B	16-22	2200	4	Own	4-4½x5	K	4
Little Giant..A	26-35	3300	4	Own	4-5½x6	K	6
Lombard.1922	85-150	8950	*2	Wisc.	6-5½x6¾	Gas.	16
Lombard.1922	50	5300	*2	Wisc.	4-4¾x6½	Gas.	6-10
Master Jr.....	5-10	585	..	LeR.	-2¾x4	Gas.	1
MerryGar1922	2	210	2	Evin	1-2⅝x2½	Gas.	..
Minne...All-P	12-25	800	4	Own	4-4½x7	G or K	3
Minne. Gen.P	17-30	1600	4	Own	4-4¾x7	G or K	3-4
Minne. Med.D	22-44	2650	4	Own	4-6 x7	G or K	5-6
MinneHeavyD	35-70	3850	4	Own	4-7¼x9	G or K	8-9
Mohawk .1922	8-16	650	2	Light	4-3½x4½	K or G	1-2
Moline Univ D	9-18	....	2	Own	4-3½x5	Gas.	2-3
Moline Orch..	9-18	....	2	Own	4-3½x5	Gas.	2-3
Motor Macult.	1½	195	2	Own	1-2¾x3½	Gas.	..
NB.....1	3-6	425	4	Own	2-3¾x4	Gas.	1
Nichols-Shep.	20-42	2650	4	Own	8 x10	G or K	3-6
Nichols Shep.	25-50	3000	4	Own	9 x12	G or K	4-7
Nilson Senior..	20-40	1975	5	Wauk	4-5 x6¼	G,K	4
Oil Pull.....K	12-20	....	4	Own	2-6 x8	K,D	3
Oil Pull.....H	16-30	....	4	Own	2-7 x8½	K,D	4
Oil Pull.....G	20-40	....	4	Own	2-8 x10	K,D	5-6
Oil Pull.....E	30-60	....	4	Own	2-10x12	K,D	8-10
Oldsmar GarK	2½-5	225	4	Own	1-5½x5½	Gas.	1
Oshkosh....M	6-12	650	2	Own	2-4 x6	G,K	1
Oshkosh....G	12-24	935	2	Own	2-6 x7	G,K	3
Peoria.....L	12-25	$1600	4	Clim.	4-5 x6½	G,K	3
Pioneer.....G	18-36	1750	4	Own	4-5½x6	G,K,D	4
Pioneer.....C	40-75	3550	4	Own	4-7 x8	Gas.	10
Plowman....A	15-30	1295	4	Buda	4-4½x6	G,K	3-4
Reliable.....	10-20	390	4	Own	2-6 x7	Ker.	2
Rex.....	12-25	1600	4	Wauk	4-4¼x5¾	G or K	3
Russell.....	12-24	1500	4	Own	4-4¼x5¾	G or K	2-3
Russell.....	15-30	2200	4	Own	4-5 x6½	G or K	3-4
Russell.....	20-35	3000	4	Own	4-5½x7	G or K	4-5
Russell.....	30-60	5000	4	Own	4-8 x10	G or K	8-10
Samson....M	....	445	4	Own	4-4 x5½	G,K	2
Sandusky,...J	10-20	1250	4	Own	4-4¼x5¼	G,K,D	2
Sandusky...E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shelby.....D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Shelby.....C	9-18	....	4	Wauk	4-3¾x5¼	G or K	2
Steady Pull..	12-24	1485	4	Own	4-4 x5	Gas.	3
Stinson....4E	18-36	1835	4	Beav.	4-4¾x6	G,K	4
Tioga.....3	18-32	....	4	Wisc.	4-4½x6	Gas.	3-4
Topp-Stewart.	30-45	....	4	Wauk	4-4¾x6¾	Gas.	3-4
Toro Cultivator	6	750	3	LeR	4-3½x4½	Gas.	2
ToroTractor'22	6-10	495	3	LeR	4-3½x4½	Gas.	2
Townsend....	10-20	800	2	Own	4-6½x7	Ker.	2-3
Townsend....	15-30	1350	2	Own	4-7 x8	Ker.	3-4
Townsend....	25-50	2500	2	Own	4-8½x10	Ker.	4-8
Traction Motor	40-50	....	4	....	8-3½x5	Gas.	4-5
Traylor....TB	6-12	500	4	LeR.	4-3½x4½	Gas.	1-2
Trundaar...10	25-40	3750	*2	Wauk	4-5 x6¼	G or K	4
Twin City....	12-20	1200	4	Own	4-4¼x6	G,K	3
Twin City....	20-35	2750	4	Own	4-5½x6¾	G,K	5-6
Twin City....	40-65	4750	4	Own	4-7¾x9	G,K	8-10
Uncle Sam C20	12-20	1295	4	Weid.	4-4 x5½	G	2-3
Uncle Sam B19	20-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21	20-30	1895	4	Beav.	4-4¾x6	G or K	3-4
Utilitor....501	2½-4	295	4	Own	1-3½x4½	G	1
Utilitor...501A	2½-4	340	4	Own	1-3½x4½	G	1
Vim.....B	15-30	1190	4	Wauk	4-4¾x5¾	G,K	3
Wallis.....K	15-25	†995	4	Own	4-4¼x5¾	G,K	3
Waterloo...N	12-25	675	4	Own	2-6½x7	Ker.	3
Wetmore 21-22	12-25	1185	4	Wauk	4-4 x5¾	G,K	3
Whitney....D	9-18	595	4	Own	2-5½x6½	Gas.	2
Wichita.....T	15-30	2000	4	Beav.	4-4½x6	G,K,D	3-4
Wisconsin...E	16-30	1850	4	Clim.	4-5 x6½	G or K	3
Wisconsin...F	20-40	2050	4	Wauk	4-5 x6¼	G or K	4
Wisconsin,..H	22-40	2550	4	Clim.	4-5½x7	G or K	4-6
Yuba....12-20	12-20	2400	*2	Wisc.	4-4½x6¾	G,K,D	3
Yuba....15-25	15-25	2750	*2	Wisc.	4-4¼x6	G,K,D	..
Yuba....20-35	20-35	3900	*2	Wisc.	4-5¾x7	G,K,D	4
Yuba....25-40	25-40	4250	*2	Wisc.	4-5¾x7	G,K,D	..
‡Yuba.....	25-40	4750	*2	Yuba	4-5½x7	D	..
Zelle.....	12-25	....	4	Buda	4-4¼x5½	G or K	3

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beav.—Beaver. Clim.—Climax. Cont.—Continental. Dom.—Domas. Evin.—Evinrude. Herc.—Hercules. LeR.—LeRoy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. T.C.—Twin City. Wauk.—Waukesha. Weid.—Weidely. Wis.—Wisconsin. *—Crawler type. All others are wheel type. †Price includes plows. §Track Runner. ‡Industrial Tractor.

DEATH OF EMIL SCHWARZKOPF

New York, June 5—Emil Schwarzkopf, a widely known and unique figure in the automotive industry, died last week in Roosevelt Hospital after an illness of several months resulting from a general breakdown. He was 70 years old.

Born in Austria, Schwarzkopf came to the United States in the 80's, and not long after his arrival started a little automobile magazine. He later established Automobile Topics, which he conducted for several years, but finally sold. At one time he developed a four-cylinder motor car.

Schwarzkopf was a thorough student of the industry and voiced his opinions frankly. He had many friends, but his very bluntness made numerous enemies for him. He had written much about the industry, and in 1909 published The Motor Cyclopedia. After he retired from the publishing field, Schwarzkopf went into the accessory business in Detroit as manufacturer's agent.

70 JOIN SERVICE ASSOCIATION

Philadelphia, June 5—The charter of the Automotive Service Assn. of Philadelphia has been closed, there being now a total of upwards of 70 names on the membership roll. It has been decided to use an emblem in the form of a gold wheel with enameled hub. It has also been decided to have an entertainment at every meeting. D. Risley Jr. has been appointed chairman of the entertainment committee.

1,000 JORDANS IN MAY

Cleveland, June 6—Production of the Jordan Motor Co. in May was 1,000 cars, according to an announcement by the company. This is the largest production for any month of the company's history.

785 OVERLANDS A DAY

Toledo, June 6—The production schedule for the Willys-Overland plant here is gradually increasing and has passed the 500-a-day mark, according to President John N. Willys.

Willys said the production schedule for July is 16,500 cars, or an average of 785 a day.

"We are 1,000 cars behind our orders now and must speed up considerably during June to make a gain on the sales," he declared.

He said his travels convinced him that next year would be better than 1922 because of the increased prosperity to come when farmers get in their crops and realize that better conditions are here.

A recent factory sales analysis shows that more than one-third of all the Overland cars sold this spring were to buyers who never owned a car before.